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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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The Future of the Craftsman

One often hears assertions that the craftsman's day is finished and that it is useless to apprentice a boy to a trade because future methods of production will eliminate handicraft. Like most generalisations this is only a half-truth, and would not merit further consideration were it not for the fact that there is, in certain trades, a dearth of craftsmen. In London and the Home Counties, for instance, there is at the present time a shortage of good skilled moulders. There is no doubt that mechanisation has done away with a great deal of hand labour, and this has probably given rise to the uneasy feeling in certain circles as to the future of the craftsman. It would perhaps be nearer the truth to say that mechanisation is producing large quantities of articles which never were made by hand, and is, therefore, creating increased employment, for much of the mass-produced goods in common use to-day could not and never will be economically made by hand labour.

After the war, and following America's lead, we in this country imagined that mass production was to prove our industrial salvation. It has certainly done a great deal to provide large numbers of the people with those amenities of life which were the prerogative of only the wealthier section of the community. The disadvantage is that all of us become possessed of exactly the same kind of article, be it wireless set, motor car, gas cooker or bath tub, differing only from type to type. We perceive a typically British dislike rising up against this standardisation and a demand for the specialised article. Mass production is a blessing so long as we keep it to its proper sphere of supplying masses for the masses. There will always be a large public willing and anxious to buy a specially-made article, and for that public the craftsman's art is demanded.

In our view the craftsman of to-morrow will occupy a much more prominent position in industry than he has ever done. Now that we have assessed mechanisation at its true value, the craftsman will stand out in bold relief as a skilled artisan against a background of machine-minders. So far as the foundry industry is concerned there is no doubt whatever that the craftsman will always be in demand. Mechanisation can take care of repetition castings, such as lawn-mower parts, but it needs the high degree of skill and intelligence of the craftsman to produce the large variety of castings which lie beyond the range of a machine; moreover, the mechanised foundry needs the most skilled moulders to prepare its master-patterns, whilst the management must be composed of men who know, *de profundis*, the art as well as the science of castings-manufacture.

The British Cast Iron Research Association

At the luncheon which followed the annual general meeting of the B.C.I.R.A. in London yesterday, of which we shall give a report in our next issue, the President, Major F. A. Freeth, dealt mainly with the very interesting and generous offer made to the Association by H.M. Government. The Association has been somewhat handicapped during the past three years by the fall in grant which took place, amounting to nearly £2,000 per annum, but it is very satisfactory to see that this difference has now been made good by the industry. In effect, the Government has offered to replace this sum provided an additional £1,000 per annum can be obtained from the industry. The change really arises from a change in Government policy, and the offer is much too good to miss. There are in the industry many firms who can legitimately be expected to support it and whose support would readily provide this sum. We cannot, indeed, believe that the industry will readily allow the opportunity to slip, for the Association is playing a large part in building up that knowledge which is, as Major Freeth put it, changing the whole face of the industry, and the whole status of cast iron as an engineering material. We are in a position to see how differently cast iron is regarded to-day, compared with even ten years ago, by technologists both in published Papers, contributions to discussions, and even in private technical discussion. Few research associations need the same publicity for their financial needs, for members are only to be obtained by individual approach. We sincerely hope that they will respond, and that they will regard the necessary outlay as an insurance premium against the depreciation of their present knowledge and technique. They can do so with the confident expectation that the policy will mature many times over. We should indeed be pessimistic about the prospects of cast iron as a material without the assurance that it was the business of some scientific body to promote its progress, watch the developments of competitive materials (such as welding, plastics, and so forth) and keep in touch with foreign thought.

XUM

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Mechanisation: Hand Production and Output

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I have read with considerable interest the letter from "The Manager of a Continental Foundry" and from "The Writer of the Article," contained in your issues of October 11 and 18 respectively on the above subject.

I quite agree, in the first case, that production can be increased by the installation of gravity conveyors for conveying the moulding boxes from the moulding machines to the pouring station and the empty boxes back to the moulding machines instead of carrying these boxes by hand to the floor. A saving, which is not mentioned by your correspondent, in this respect is that the number of moulding boxes actually in daily use is thereby reduced considerably.

On the other hand, it must not be overlooked that the cheap gravity conveyor mentioned by your correspondent in your issue of October 11 possesses great disadvantages, because, in the first case, it is necessary to push the moulds by hand round this conveyor, and, in the second place, it is very difficult to be sure that the moulds will not be broken before pouring takes place, and, in the third case, the psychological effect in the "pace maker" of the continuous automatic mould conveyor is entirely lost by the installation of a cheap gravity conveyor.

I am perfectly sure that your correspondent "The Manager of a Continental Foundry" would find that the pecuniary gains with the complete casting installation, composed of an automatic conveyor, would greatly exceed the gains which he claims he has obtained from the introduction of the cheap gravity conveyors.

With regard to the statement, made both by "The Manager of a Continental Foundry" and by "The Writer of the Article" regarding production of British railway chairs, it may be of interest to your readers to know that within the last 18 months a test was made with moulding machines with two British railway chairs in a box, two men operating the machines, one man on the drag side and the other on the cope side, and these two men obtained an output of 60 complete moulds per hour, with two chairs in a box—in other words, 120 chairs per hour, which is very much better than either the production mentioned by your correspondent in your issue of October 11, or, on the other hand, your correspondent in your issue of October 18. We would also mention that this production meant the removal from every mould of six loose pieces, and this was accomplished by the two men, and is part and parcel of the production shown above.—Yours, etc.

AUSTIN S. BEECH
(Managing Director).

Foundry Equipment, Limited,
17, Victoria Street, London, S.W.1.
October 26, 1934.

Foundry Query

We should be very glad to have your suggestion as to the best method of running cylinder liners, the dimensions of which are as follow:—Length 14 in., outside diameter 6 in. with a thickness of ¾ in., the finished machine size is length 13 in., inside diameter 5¾ in., ½ in. thick. The liners are subjected to a water pressure of 60 lbs. and the percentage of scrap through spongy patches is considerably higher than it should be. We are aware that centrifugal casting would solve our problem, but we do not propose to adopt this method.

S. G. D. G.

District Presidents.—No. 8

PRESTON SECTION OF THE INSTITUTE OF BRITISH FOUNDRYMEN

Mr. F. W. C. Hinton, President of the Preston Section of the Institute of British Foundrymen, was educated at Sir Joseph Williamson's Mathematical School, Rochester, Preston Grammar School, and the Harris Institute Technical School, Preston, where he received the Higher National Certificate in Mechanical Engineering. After leaving the Technical School, Mr. Hinton joined Messrs. Joseph Foster & Sons, Limited, general and printers' engineers, iron and brass founders and boilermakers, as an apprentice. After a thorough training, covering four years, he was

MR. F. W. C. HINTON.

made assistant works manager. Following this he was appointed works manager at the Lancaster branch foundry and works of the same company, and had full charge of these works for 12 months, when he was appointed works manager with full charge of all departments at the Soho Foundry, Preston.

Protection of Irish Foundries

Six months ago the ironfounding industry in the Irish Free State was faced with the probability of a large foreign company opening up in the country. This interesting fact was revealed in Dublin recently, when Mr. Joseph Milroy (chairman), addressing a meeting of the Federation of Free State Industries, Limited, spoke of the work done by the Federation for the protection of home ironfounders. Mr. Milroy said that the provision of the necessary ranges, grates, etc., for the various housing schemes had taxed the capacity of the ironfounders of the Free States to the utmost. Other schemes for the development of Irish industry were contemplated by the Government, and these would make further demands on the output of the ironfounders. Unless these demands could be met it was almost certain that a foreign foundry would have to make up the deficiency. Realising the gravity of the position, the Council of the Federation immediately summoned a conference of all the ironfounders. The position was thoroughly examined; the capacity, present and potential, of each foundry was discussed, and in a final conference with the Government, arrangements were made whereby the Free State ironfounders will be in a position to respond to all reasonable demands made on their output. Therefore the possibility of another foreign firm taking root in the country to the detriment of national industrialists was obviated, declared Mr. Milroy. Similar action on behalf of other industries was in progress.

Random Shots

Last week "Marksman" happened to come upon a flourishing London suburb where he had lived for seven years until, in fact, last March. The place had, in his short absence, strangely changed. The main street now seemed to be permanently *en fête*. There was a suggestion of Chinese lanterns and masquerade in the air. Every crossing—and there are many in that particular street—was starred with amber globes such as would have delighted the hearts of Haroun al Raschid and the producer of Chu Chin Chow. The place had, in fact, been transfigured by Mr. Hore-Belisha.

* * *

The "Belisha Beacons" have apparently proved a temptation to collectors of curios. It is said that, since the standards have been erected, more than 65 amber globes have gone during the night, leaving the standard naked and ashamed to face the light of day. The globes make excellent bowls to keep goldfish in and it is an easy matter to remove them. They can, or could, be removed as easily as taking a bulb from the electric-light bracket. Since this crime wave swept over London, goldfish keepers are being kept under observation.

* * *

According to a curious little newspaper story, passers-by in a London street were recently amazed to see a "Belisha Beacon" swaying gently in the breeze. They stopped, stared, and stayed. Yes, undoubtedly the globe was slowly lurching from side to side with a morning-after-the-night-before air. Many were the horror-stricken resolutions to abjure alcohol and join the Temperance League, until some brave soul examined the beacon. The mystery was soon explained. Apparently, the night before a lorry-driver had backed his lorry into the standard, and the globe, breaking off, had fallen into the back of the lorry. The lorry-driver had driven off and, no doubt finding the globe useful for his goldfish, had said nothing more about the matter. In the meantime, some anonymous joker had seen the forlorn standard and fixed on to it an amber balloon.

* * *

As a foundryman, "Marksman" can only suggest to the Minister of Transport that the globes should be solid and permanent, and should not have fragile, easily-removable globes which any convivial goldfish fancier may steal. They should, in fact, have cast-iron frames with amber windows.

* * *

The subject of traffic signals reminds "Marksman" of the story of Edouard Branly, the French savant, who has just celebrated his ninetieth birthday. He always uses two sticks for walking across the road. "Not that I need them," he says. "But if I only used one, motorists would take me for some young blood, able to dash out of their way like a racehorse. With two sticks I can cross the road comfortably."

MARKSMAN.

Iron Oxides in Slags

In the "Archiv für das Eisenhüttenwesen," H. SOLMANG and J. KALTENBACH describe researches on the various stages of oxidation of iron in the systems FeO-SiO_2, CaO-FeO-SiO_2 and CaO-FeO-Fe_2O_3-SiO_2, with special reference to the chemical composition at temperatures of 1,230, 1,320 and 1,410 deg. C. in an oxidising atmosphere. They found that CaO favours the ferri-reaction and SiO_2 and Al_2O_3 the ferro-reaction. In the last-named system ferro-ferri-formation is determined by the ratio CaO/SiO_2. Al_2O_3 being a weak acid only causes a slight ferri-reaction. Increase in temperature favours the dissociation of the slag and hence also the ferro-reaction. Dissociation in the range 1,320 to 1,410 deg. is about 50 per cent. greater than in the range 1,230 to 1,320 deg.

Modern Trends in Foundry Practice

MR. NORMAN COOK'S PRESIDENTIAL ADDRESS

The opening meeting of the Lancashire Branch of the Institute of British Foundrymen for the session 1934-35 took place at the Engineers' Club, Manchester, on October 6. Mr. Roy Stubbs, President of the Institute, was in attendance.

Mr. Roy Stubbs, in introducing the Branch-President (Mr. N. Cook), said that most of them would have very pleasant recollections of that gentleman's father as a popular representative of the Branch and of the foundry industry. If the son was as good as his father, they could rest assured they would have the pleasure of listening to a most interesting address. Personally, it was a very great pleasure to him to think that Mr. Cook, who was one of the youngest members of the Branch, had now attained such a high office as the President of the Lancashire Branch.

PRESIDENTIAL ADDRESS

Mr. N. Cook, the Branch-President, then delivered his presidential address, in the course of which he said:—During the past twelve months there has been undoubtedly considerable improvement in the foundry trade of this district, especially in the iron foundry, and I feel sure that the outlook for the qualified man is brighter than it has been for the past six or seven years. In fact, the shortage of skilled moulders is acute to-day, and if we get another 25 per cent. improvement in trade, we shall be forced to utilise the skilled men for skilled work only, and relegate, to an even greater extent than heretofore, what might be called the "donkey work" to machines and unskilled labour.

The progress of mechanical aids in the foundry has been very rapid during the last ten years, and I feel that it will proceed with even greater rapidity in the future, even in the jobbing foundry. This should lead to a much better rate of pay for the skilled man and better conditions, and as a corollary thereof induce an influx of apprentices of a better type.

As an institute the supply of labour is not our function, but it is a subject that affects us vitally as individuals, and will, I fear, cause us to have many grey hairs in the future. However, it is the man with ideas, and the knowledge to apply them, that in the future, as in the past, will come to the top, and what better method of getting ideas, broadening outlook, and seeing what other people are doing, could be found than in the lectures, works visits, and discussions of this Institute?

Nobody is too old to learn, and for your own sake I appeal to you to support the Institute and to do everything in your power to point out its advantages to those people whom you know would give us all some help, and who, at the same time, would be themselves benefiting by us. Trade has improved, but we cannot afford to be complacent about it. If we sit down and do nothing, non-foundry competitors will have an easy time.

The nature of our industry has changed rapidly, and this change will gather impetus as time goes on. Founding used to be a mystery. We are now passing from the stage when personal experience was the only factor in success to the stage of scientific control of materials and processes; but we must realise that experience remains, and will remain, a very important factor when dealing with so many variables. The practical and the scientific man must both realise that the other man's contributions are as important as his own, and endeavour to work together with mutual understanding and forbearance to make a homogeneous machine for the production of improved castings. The important thing is to forget past frictions and strive for future combination.

Competition from Weldings

In the iron foundry, the progress of welding has been very rapid, and to a certain extent, I think, has somewhat over-reached itself, but will always be there as a substantial competitor. It will have done us a certain amount of good; firstly, it has stimulated us to the production of better iron and to a more scientific study of the lightening of castings. It should also induce, in designers and engineers, less demand for what I might term "fancy designs," which may look very pretty but cause the foundry endless labour to manufacture. If they will accept the stark crudity of a welded structure, surely in time their demands on the foundry will become more reasonable. Experience has proved what might have been expected in the first case, that for structures subject to vibration the rigidity and "deadness" of cast iron is infinitely preferable to the "springiness" of rolled steel, and for damp hot conditions the corrosion resisting powers of cast iron compel its use.

We must recognise that welding has come to stay and work with it, and I think that the tendency in the future will be not for a welded or a cast structure in itself, but for a combination of both, whether in cast iron or steel. With castings, rolled sections or forgings of either metal welded together, each part being the most suitable for the duty required.

Steel and Non-Ferrous Castings

Perhaps the most difficult section of our industry is that of steel castings, and recent improvements in the quality of these products have enabled the steel founder to penetrate markets which have for many years been the preserves of the forge master.

In the non-ferrous industry there is the competition of pressing, stampings, and the plastics. Each of these has undoubtedly come to stay in its own sphere, though the sphere may not be quite as wide as the trumpetings of its protagonists would have you believe.

The initial outlay for plant and tools and also the maintenance costs for all these processes are very often conveniently forgotten when talking about economy in production.

In the sphere of non-ferrous castings the founder is liable to suffer from the multiplicity of alloys specified by various designers, many of the compositions varying but slightly in their properties. The Non-Ferrous Committee of our own Technical Committee is endeavouring to draw up a short list of recommended compositions which will fulfil all the duties that the engineer may require, and if these can be adopted as a standard they will very much simplify the job of the foundryman.

Those of us connected with a brass-foundry, even in a small way, know the difficulty of identifying the various alloys without analysis, if, by some chance, the material should get into the wrong bin, especially as we realise that there are many hundreds of published compositions, the duties of the majority of which could be covered by, say, fifteen standard alloys, and probably fewer than that.

Light Alloys

The section of the non-ferrous foundry that is expanding most rapidly at the present moment is undoubtedly the aluminium foundry, and with that I include magnesium. In fact it is making quite considerable inroads upon the trade of the iron foundry. The tendency for everything to-day is for lightness and mobility. The limitations of the size of Battleships has led to very great thought being devoted to the lightening of all parts which are not part of the armament, and the perfecting of aluminium alloys resistant to salt water corrosion has greatly increased the use of light alloys by the Admiralty. More and more aluminium is also being used in liners and commercial shipping. In the motor vehicle industry, taxation limits by weight have led to the saving of every available ounce and have given a tremendous fillip to the use of magnesium, the use of which in this country has grown amazingly in the last two years.

The alloys of aluminium are legion, and fresh ones are being continually patented. A well-known firm in Trafford Park has been very much to the fore in the development of these alloys, and I saw in the local papers the other day that they were now beginning to replace wooden beer barrels by aluminium ones.

During the last 20 years the world has grown much smaller and the pace of life has greatly increased. This calls for greater quickness in operation, and everything must be as light as

International Foundry Congress Delegates on the "Lafayette"

Standing (*left to right*): V. Delport, E. Magdelenat (French), H. Spence-Thomas, H. Jeans, T. Makemson, M. Vicaire (French), F. H. Hurren, A. Brizon (French), Mme. Brizon, James Smith, J. Leonard (Belgium), R. Benoist (French).

Sitting: P. Daugenet, R. Bachon, G. A. Daugenet, M. Coqueugnot (all French).

possible for the saving of time and power. The uses of aluminium are unlimited, and I believe that its foundry products will find a continuous and expanding market in the future.

We have passed through some very lean years recently, but the foundryman has never given up heart, and has continued to improve his plant and his products. New competitors have produced better products as an answer, and I think that in the near future the foundry will come into its own and will be able to obtain a fairer recompence for the hard work entailed; but we must continue to progress, and that cannot be done by one man on his own, but must be by the joint efforts of all of us, and in the industry I can see no more suitable vehicle for the exchange of ideas and the creation of fresh ones than this Institute. I again express my deep appreciation for the honour you have done me in electing me your President.

Vote of Thanks

MR. JOHN JACKSON (Accrington) proposed and MR. A. L. KEY (Stockport) seconded the vote of thanks.

The Junior Section

MR. A. L. KEY stated that a special effort was being made this year to bring back the Junior Section to something like the position it occupied at its inception. Those members of the Institute who had visited the meetings of the Junior Section in the past were aware of the enthusiastic gatherings which used to take place. But, as was so frequently the case with young people, the interest in the meetings began to wane, other attractions prevailed, and the attendances had begun to dwindle. An effort was now being made to inaugurate meetings which were of a not too highbrow character, and which were more in the nature of homely talks. Most of those present had lads working for them, and he appealed to them to do all they could to induce them to join the Junior Section and attend its meetings. The time of meeting had been changed from Saturday afternoons, when the boys felt the urge of other attractions, to Friday evenings. The future of the industry looked rather black from the point of view that there were not sufficient craftsmen engaged in it at present, and doubtless when business began to be more brisk that shortage of craftsmanship would begin to make itself seriously noticeable. There was no doubt that the industry was making great progress scientifically, but nevertheless they must have the practical man to help in the work also.

MR. W. N. COOK (Branch-President) said he had had a great deal to do with the inception of the Junior Section. He wished to impress upon all the members that the youth of to-day was the future member of the Lancashire Branch and of the Institute. He most earnestly supported the plea of Mr. Key that the young men and boys in the industry should be encouraged to join the Section. Some boys stated that they could not attend the meetings of the Junior Section because they were working overtime, and therefore he appealed to all those who employed them to make arrangements for them to be free to attend the meetings of the Junior Section on Friday evenings. Many of the boys could well afford to pay the small subscription necessary.

Progressive Instruction

MR. S. E. DAWSON (Nottingham) suggested that for future sessions it might be worth while to inaugurate a series of lectures, eight or twelve in number, dealing with foundry practice in its entirety. If young men and boys knew that there was a regular sequence in the lectures there might be more induced to attend there regularly, particularly when they realised that a great deal of thought had been devoted to them by the specialists in the industry. This system might be carried on for two or three years, if necessary. An alternative would be to draw up a series of lectures by well-known men in the industry, not necessarily in sequence, but on some prearranged basis, so that there was no overlapping, and so that a fair number of subjects would be included.

MR. A. L. KEY wished to thank Mr. Dawson for his suggestion. What they were trying to do was to gain the confidence of the lads. The lecturers would deal with their subjects more or less in the form of homely talks and not in a technical manner which was too far advanced for the understanding of the junior members. It was really a question of ascertaining what the lads wanted and then giving it to them. There was a technical class established in the Openshaw school which was second to none for its efficiency. A foundry had been installed and adequately equipped with the necessary appliances for gaining progressive knowledge. Those classes started on such a large scale that there was not sufficient room for the students, but now there was great difficulty in getting a sufficient number of students to attend in order to form a class at all.

MR. J. E. COOKE (Branch-Secretary) said that there was a great shortage of students of from 14 to 15 years of age. He appealed to those particularly who were connected with apprentices in the Bolton district to encourage the attendance of boys at the Bolton class.

The Institute of Vitreous Enamellers

NOTES FROM THE BRANCHES

Southern Section.—A meeting was held on October 24 at the British Industries House, Marble Arch. Mr. B. B. Kent presided, and was supported by the chairman of the Institute, Mr. W. H. Whittle. The evening was devoted to the hearing of a Paper on "Enamelling Iron," by MR. N. H. OAKLEY-EVANS. There were about 40 people present and an animated discussion followed. Mr. Oakley-Evans in his Paper covered the history of ironmaking, the decline of the Bessemer process and enumerated a theory of surface adhesion between the iron and the enamel. The Paper and the discussion will be printed in our contemporary "Sheet Metal Industries," joint official organ of the Institute with THE FOUNDRY TRADE JOURNAL.

At a meeting of the Council held on October 24 at 49, Wellington Street, the following were elected members of the Institute:—

The Gramophone Company, Limited, Blyth Road, Hayes, Middlesex. (Rep., Mr. Muzzell.)

W. & T. Avery, Limited, Soho Foundry, Foundry Lane, Birmingham. (Rep., Mr. F. B. Sellars.)

Amos England, Consulting Chemist, "Noyna," Kidderminster Road, West Hagley, near Stourbridge.

John Page Lorains, Chief Chemist, Doulton & Company, Limited, High Street, Lambeth, S.E.1.

Armco, Limited, Thames House, Millbank, London, S.W.1.

A. Cyril Roberts, C. Christopherson & Company, Limited, Marlow House, Lloyd's Avenue, London, E.C.3.

Mead, McLean & Company, Limited, Grand Buildings, Trafalgar Square, W.C.2.

Richard George Oliver, 13, Burnham Road, Dagenham, Essex.

Miss Mary Beard, 249, Grosvenor Buildings, Manisty Street, London, E.14.

The Metalline Enamelling Company, Limited, 263/5, New John Street West, Birmingham. (Rep., Horace H. Lowe.)

Porcelain Enamel & Manufacturing Company, Baltimore, Maryland, U.S.A. (Rep., Mr. Paul Neigsch, c/o Incandescent Heat Company, Cornwall Road, Smethwick.)

R. R. Archer, James Gray & Sons, Limited, 5, Victoria Street, London, S.W.1.

J. F. Barry, Messrs. James Gray & Sons, Limited, 5, Victoria Street, London, S.W.1.

MIDLAND SECTION

The formation of the Midland Section of The Institute of Vitreous Enamellers was given full effect on Thursday, October 25, when, in the unavoidable absence of Mr. W. H. Whittle (Chairman and Vice-President), Mr. J. W. Gardom presided over a good attendance at Birmingham Chamber of Commerce. The Chairman, after extending a welcome to members, who came from an area which embraced Stoke-on-Trent, Burton-on-Trent, North-West Worcestershire, the Black Country (including Wolverhampton, Smethwick and West Bromwich), Warwick, Rugby and Birmingham, said it was felt advisable to appoint a small committee to run the Section, together with an honorary secretary. There were, as they knew, four members from the Midland Section on the General Council of the Institute, and it was thought that three other members might be elected to assist in the work and make the committee representative without being unwieldy.

After MR. W. TODD (Vice-Chairman of the Council) had read a list of members in the Section. The CHAIRMAN said he hoped all would make an effort to secure new members. It was not a matter of getting a large number, but of banding people together who were really interested in vitreous enamelling and in helping the Institute forward. The Institute had been given a most remarkable start, and the programme of lectures was an admirable one.

Mr. F. B. Sellars (Avery's, Limited) and Mr. S. Hallsworth (Parkinson Stove Company) were duly elected to the Committee. Both the CHAIRMAN and MR. TODD suggested that the nomination of a third member should be left open until the members had got to know each other better, and the latter said it might be desirable for the Committee to have power to co-opt, especially as it was preferable to have the services of someone within easy reach of Birmingham.

The Council representatives on the Committee, in addition to the Chairman and Mr. Todd, are Mr. W. S. Grainger (Stocal Enamels, Limited, Burton) and Mr. W. Noake (Patent Enamel Company, Selly Oak, Birmingham).

As regards a secretary, MR. TODD said they would all agree that it was advisable to cast around beforehand to find a suitable man, and he had accordingly taken the liberty of sounding Mr. S. Hallsworth, who happened to be superintendent of the Parkinson Stove Company enamelling department. He gathered that Mr. Hallsworth was perfectly willing to act, but of course the matter was entirely in their hands. MR. SELLARS then proposed and MR. READ seconded that Mr. Hallsworth be appointed secretary, and, there being no other nominations, he was unanimously elected. Mr. N. H. Oakley-Evans then delivered his lecture on enamelling irons.

Of interest to vitreous enamellers will be a Paper on "Recent Developments in Silicate Enamels and a Study of their Industrial Uses," by E. E. Geisinger, B.Sc., to be read before the Glasgow Section of the Society of Chemical Industry at the Royal Technical College, Glasgow, on Friday, November 30, at 7.30 p.m.

Practical View of "Elastic Limit"

Under this title "Steel" publishes a brief summary of a Paper by PROF. J. B. KOMMERS in which it is pointed out that the terms "elastic limit" and "proportional limit" have simple definitions, but their practical determination is complicated by many factors. The author cites his own results on a series of steels to show that for steel the elastic limit and the proportional limit are nearly identical. His results on a series of brasses show that in making a determination of the elastic limit, the repeated loadings used in making the test may influence the result obtained by changing the material from its original condition. The Committee of the American Society for Testing Materials defines "yield strength" as the stress at which a material exhibits a specified limiting permanent set, and suggests a simple manner of determining it.

Steel Castings

By W. H. Hatfield, D.Met. (Director of the Brown-Firth Research Laboratories, Sheffield)

(*Concluded from page 254.*)

Turbine Steam-End Casing

For this casting, mould and cores were entirely constructed in a "Compo" of old pots, silica bricks, sand, china clay and coke breeze well ground. The facing in the mould was 3 to 4 in. deep, the backing being in floor sand. For the cores, the facings were up to 3 in. thick for the larger ones and about 1 in. for the steam passages, the core centres being coke ashes, etc. The mould was rammed up and divided into sections for convenience in drying and in placing the cores. The total number of "drawbacks" was 10 and the number of cores 19. Drying was carried out at approximately 320 deg. C. for periods up to 48 hrs., according to size. After part-drying, and whilst warm, the surfaces were sprayed with tar and given a further drying.

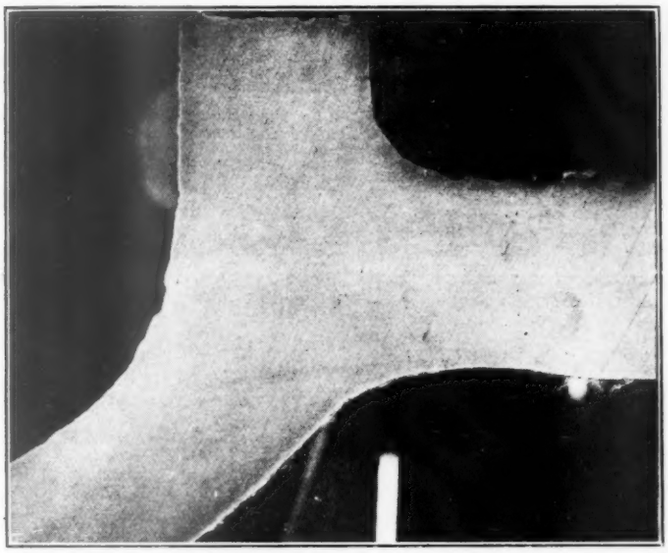

Fig. 11a.

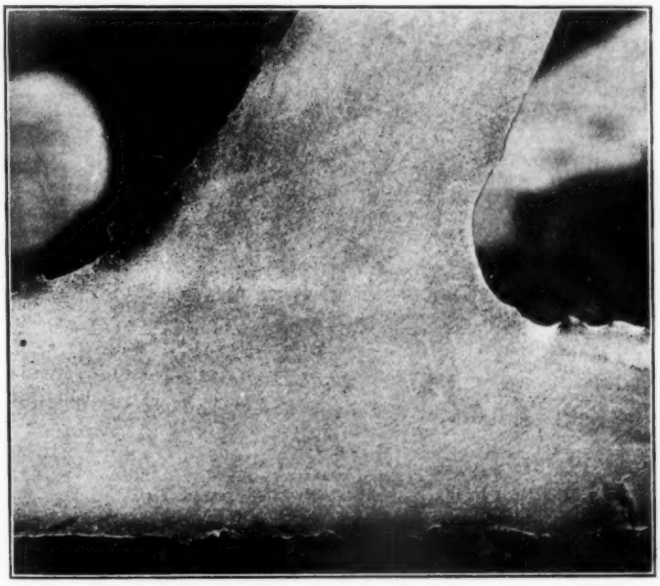

Fig. 12b.

The steel was melted in an acid Siemens furnace, the actual analysis being:—Carbon 0.18, silicon 0.38 and manganese 0.75 per cent. The charge was of about 30 tons. The casting temperature was 1,570 deg. C., and the metal was cast simultaneously through two $1\frac{3}{4}$-in. nozzles in the same ladle.

Further metal (about 25 cwts.) was added to all the top "heads" on the casting about 1 hr. after casting, this metal being taken from a separate furnace.

The metal was run simultaneously through two vertical runners $2\frac{1}{2}$ in. dia., via the bottoms of two heads A and B situated near the outer covers of the large end flanges of the casting. The runners were constructed of fireclay runner sleeves. The heads A and B, which were totally enclosed by compo, were of 16 in. dia., connected to the mould through suitably radiused passages. These heads were stopped off at 3 ft. height, except for central 3-in. passages at the top. Other heads provided on the casting were as follow:—C (16 in. by 12 in. oval) at the crown of the end flange; D and E (18 in. dia.) over bottom flange at the ends of the casting, not far from the vertical central plane; F (7 in. dia.) on gland face; G (12 in. by 16 in. oval) on the same level as C, placed at the centre of the casting just below the horizontal valve box; H and I (12 in. by 10 in. oval) 1 ft. 7 in. each side of centre of casting, as indicated, feeding the rib projecting portion of the inner cylinder; J, a small head (7 in.) over central rib at the top; K and L 14-in. heads over flanged ends of top valve box; M, N, O, P, Q and R, oval heads (12 in. by 10 in. over bosses and valve box); S and T, heads 7 in. dia. over extending upper portion.

Thus there were 20 heads. The gross weight of the casting, including heads, was $25\frac{1}{4}$ tons, the weight after removal of heads, but before machining, $14\frac{1}{4}$ tons, and weight as supplied to the turbine builders, 13 tons 1 cwt.

The casting was eased in the mould round the feeder heads within 2 hrs. of casting, but otherwise cooling was allowed to proceed without interference for a period of 9 days, by which time the temperature through was at about 100 deg. C. It was then roughly dressed. The smaller heads at this stage were partially removed, and the larger heads cut away by the oxy-acetylene flame to within about 2 in. of the casting proper, the object being to minimise the effect of heavy masses during heat-treatment. All cores were loosened out, but not completely cleaned. The residue of sand in certain portions (*e.g.*, steam passages) had the advantage of keeping down scaling effects during heat-treatment.

The casting was placed in the annealing furnace, standing practically cold, and heated up slowly with the furnace. The furnace was producer-gas fired, and the heating-up occupied a period of 30 hrs., and the upper limit of temperature of heating was 900 deg. C. After maintaining the casting at this temperature for 24 hrs., it was allowed to cool slowly in the furnace to 600 deg. C., and was then slowly reheated to 750 to 770 deg. C., held for 16 hrs. and finally cooled off in the furnace very slowly. The heat-treatment covered a total period of 14 days.

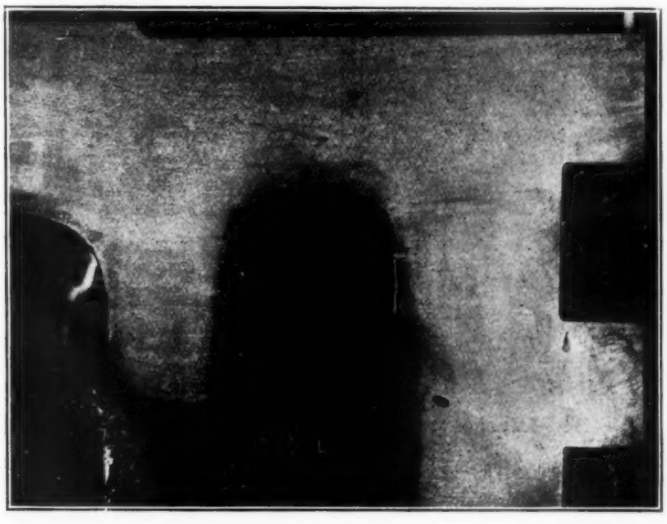

Fig. 13c.

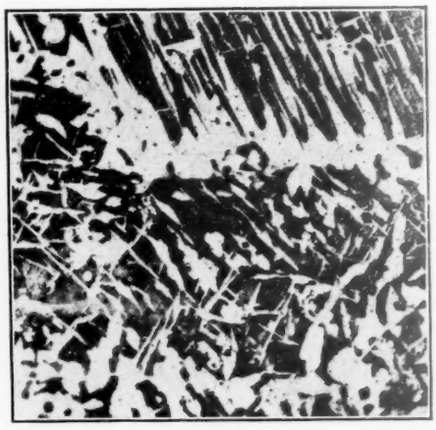

Fig. 16.—0.2 per cent. Carbon Steel. As Cast. × 50.

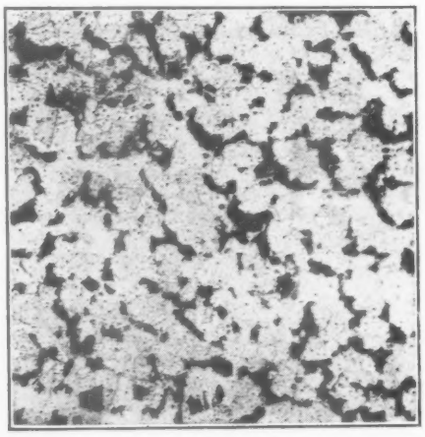

Fig. 17.—0.2 per cent. Carbon Steel. As Cast, Reheated to 900 deg. C. for 2 hrs. and Air Cooled. × 50.

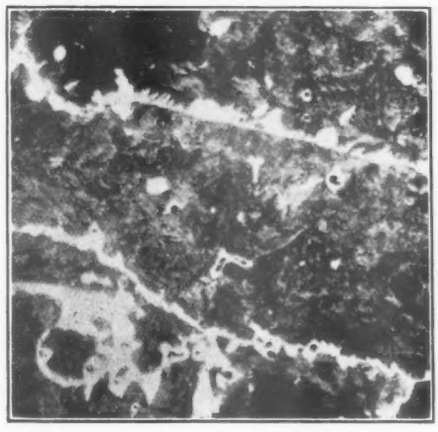

Fig. 18.—0.4 per cent. Carbon Steel. As Cast. × 50.

Fig. 14d.

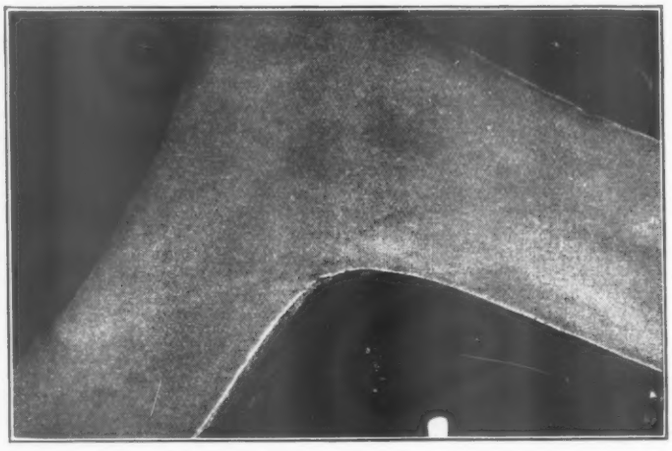

Fig. 15e.

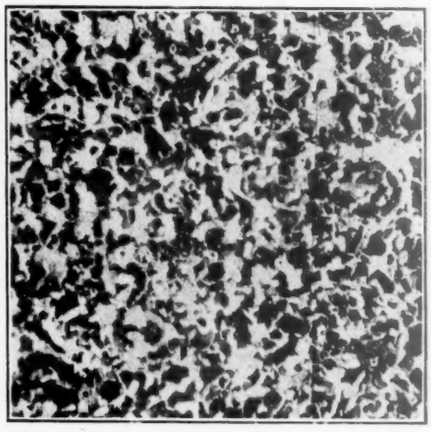

Fig. 19.—0.4 per cent. Carbon Steel. As Cast, Reheated to 900 deg. C. for 2 hrs. and Air Cooled. × 50.

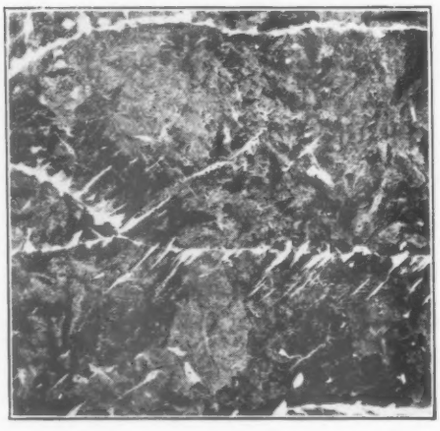

Fig. 20.—C-Cr Steel (0.51 per cent. C, 1 per cent. Cr, 0.64 per cent. Mn). As Cast. × 50.

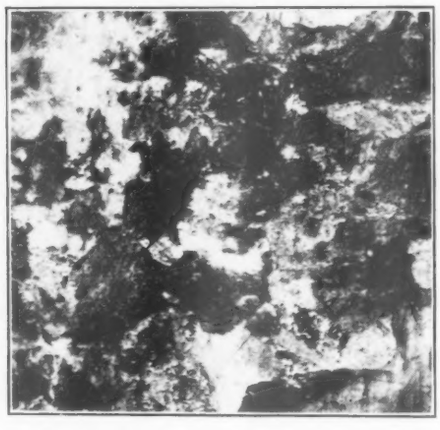

Fig. 21.—C-Cr Steel (0.51 per cent. C, 1 per cent. Cr, 0.64 per cent. Mn), Annealed, Reheated to 850 deg. C and Oil Quenched. Finally Tempered at 620 deg. C. × 200.

The casting was then rough machined, fins, etc., removed, and a further low-temperature annealing treatment given. The temperature was 650 deg. C., and the total period occupied, including heating and cooling times, was six days. The casting was finally dressed, chiefly by shot-blasting, and was then ready for delivery.

Fig. 8 shows the rough-machined casting. This was then sectioned, and the disclosed surface is seen in Fig. 9, and it will be seen how free the internal metal is from any shrinkage or other defects. The plane of sectioning can be readily determined from the drawings in Fig. 10.

The surface exposed by the sectioning was now prepared in the usual way, and then etched to bring up the macrostructure. Figs. 11 to 15 show the structure as developed at the five positions A, B, C, D and E, as indicated in Fig. 9. It is clear that the feeding arrangements have operated successfully. Test-pieces cut from the casting in its final conditions gave the following results:—

	A.	B.
Tensile test, yield point, tons/sq. in.	16.0	16.5
Maximum stress, tons/sq. in. ...	31.4	31.7
Elongation per cent. on 2 in. ...	32.0	30.0
Bend tests, 180 deg. without cracks on $\frac{3}{4}$-in. by $\frac{3}{8}$-in. section.		

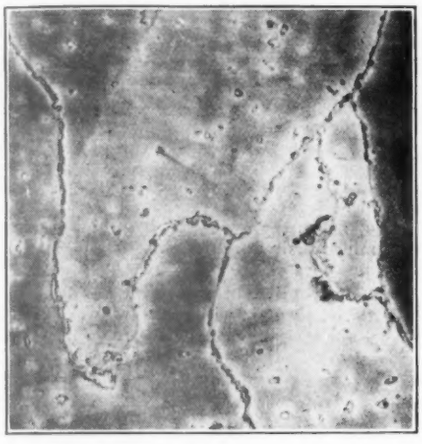

Fig. 22.—12 per cent. Mn Steel. As Cast. × 50.

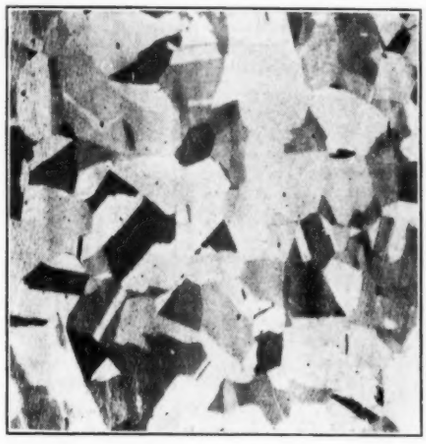

Fig. 23.—12 per cent. Mn Steel. Water Quenched from 1,000 deg. C. × 200.

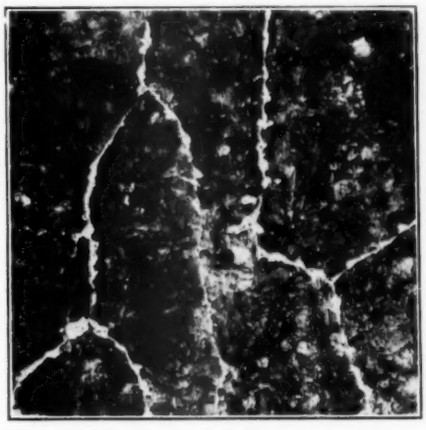

Fig. 24.—1.5 per cent. Ni-Cr (0.35 per cent C., 1.6 per cent. Ni, 0.7 per cent. Cr, 0.7 per cent. Mn). As Cast. × 50.

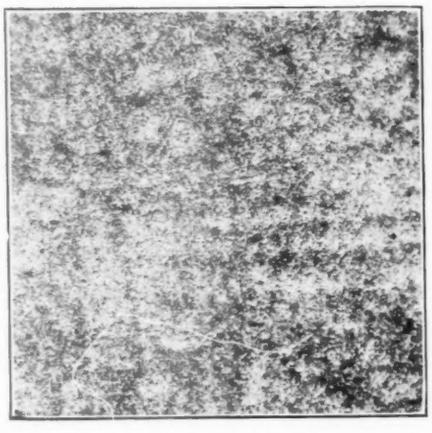

Fig. 25.—1.5 per cent. Mi-Cr Steel, Annealed, Reheated to 850 deg. C. and Oil Quenched. Finally Tempered at 650 deg. C. × 50.

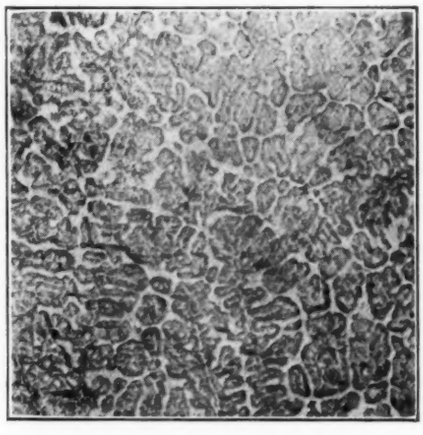

Fig. 26.—14 per cent. Cr Stainless Steel. As Cast. × 50.

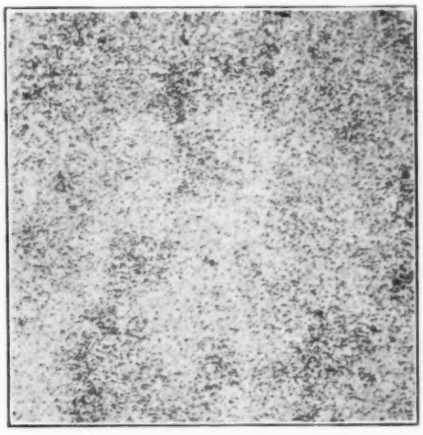

Fig. 27.—Annealed, Reheated to 960 deg. C. and Oil Quenched. Finally Tempered at 750 deg. C. × 200.

up to the maximum temperature should be at a sufficiently slow rate to avoid the superposition of heating up stresses, since in general these would be additive to the stresses left in after casting, and would tend to cause "clinking." In large castings this is a very serious danger.

The system of crystallisation formed in the steel when solidifying, noted in (2), is usually not only coarse, but of somewhat acicular form, and tends to a deficiency in ductility if not actual brittleness. Naturally, the degree to which this exists varies very much with the type of steel, as well as with the size of casting and casting temperature. A prolonged heating, at a temperature well above the upper critical point of the steel, applied to the casting gives opportunity for diffusion of the constituents, which form a solid solution at high temperatures and subsequent cooling provides for a recrystallisation, resulting in a refined structure. This treatment for most castings can be combined with (1), as indicated by the example quoted later.

This aspect of heat-treatment is successfully dealt with for mild carbon-steel castings without difficulty, and resulting mechanical tests are of a high order. In the case of alloy steels, particularly the richer alloy steels of fairly high carbon content—*e.g.*, 3 per cent. Cr, 0.9 per cent. carbon—the diffusion of carbides is a much slower procedure, and extended annealing periods may be necessary. The necessary times and temperatures to give the desired result for each type of steel can only be arrived at by experience.

As to (3), it will be appreciated that whilst many castings are in their most satisfactory condition for service in the annealed condition, there are many special purposes for which a somewhat higher hardness is desirable. Carbon-steel castings are given a slightly higher hardness by normalising—air-cooling from above the recalescence point—instead of annealing. Certain alloy steels—*e.g.*, nickel chrome, or nickel chrome molybdenum steels—may, after annealing, be given a hardening and tempering treatment, whilst "austenitic" alloy steels, such as 12 per cent. manganese or high Cr-Ni stainless steels, require putting into the true austenitic condition, which demands a rapid cooling from a fairly high temperature.

It will be appreciated that the application of any drastic "cooling" treatment to a casting is liable to set up serious stresses during and after such treatment, and discrimination is required in deciding whether such treatment is a safe procedure, having in mind the size and form of the casting. In any case, except for the austenitic steels, a suitable reheating or

Heat-Treatment of Steel Castings

Steel castings require heat-treatment to put them into a "serviceable" condition from several points of view:—(1) To liberate casting stresses; (2) to break down the casting struc-

tempering treatment should follow any hardening or quenching, so as to minimise residual stresses as well as to remove brittleness and lack of uniformity in hardness.

As in the case of the heat-treatment of forgings, the pieces require adequately supporting and handling so as to prevent distortion, either while hot, or during heating and cooling.

In Table I will be found the results of different heat-treatments on two examples of cast material in carbon steel, the carbon contents being respectively 0.11 per cent. and 0.29 per cent.

TABLE I.—*Influence of Heat-Treatment on Plain Carbon Steel Castings.*

Type of steel.	Analysis, per cent.					Heat-treatment.	Mechanical tests.			
	C.	Si.	Mn.	S.	P.		Y.P.	M.S.	El, per cent.	R.A., per cent.
Mild steel—										
0.11 per cent. carbon	0.11	0.27	0.33	0.04	0.03	As-cast	14.8	29.7	17.0	24.0
						890/900° C., 10 hrs. Air cooled	14.4	28.0	38.0	66.0
						890/900° C., 10 hrs. Air cooled. Reheated 600° C. 2 hrs.	12.8	25.6	38.0	64.0
						890/900° C. 10 hrs. Cooled to 600° C., raised 770° C. 6 hrs. Cooled slowly	13.6	26.0	39.0	66.0
						890/900° C. 10 hrs. W.Q. T. 600° C. 2 hrs.	16.4	27.6	38.0	61.6
0.29 per cent. carbon	0.29	0.24	0.81	0.03	0.03	As-cast	19.6	35.2	10.0	12.0
						890/900° C. 6 hrs. Air cooled	22.4	37.6	20.0	27.6
						870/880° C. 20 hrs. Air cooled	22.0	35.2	26.0	30.8
						840/850° C. 8 hrs. Cooled to 600/620° C., held 4 hrs. and slow cooled	21.6	34.0	17.0	21.6
						890/900° C. 6 hrs. Air cooled. Reheated 630° C. 2 hrs. Furnace cooled	22.0	37.2	23.0	30.8
						890/900° C. 6 hrs. Cooled 600/620° C. 2 hrs., held and cooled very slowly in sand	17.6	33.2	30.0	44.8
						870/880° C. 20 hrs. Cooled to 600° C. Reheated 770° C. 6 hrs. Air cooled	21.9	35.0	25.0	36.3

In Figs. 16 to 27 typical photomicrographs are given of the "as cast" and heat-treated condition of steel castings of different compositions, so that, metallographically, comparison can be made with present American practice.

General

The author trusts that, so far as the limitation of space in this short Paper permits, a useful account has been given of the points of view of the British steelfounder. Much more space could be given to the single phase of feeding and making sound, but it is hoped that sufficient data have been given.

It must, of course, never be forgotten that a steel casting is not a steel forging. The latter is based on an ingot, the production of the soundness of which has been the first consideration; simple in design, narrowest section at the bottom, greatest sectional area at the top and the ingot proper having superposed upon it an adequate refractory-lined feeder head. On the other hand, as regards castings, the designer produces the ultimate shapes most likely best to serve his purpose and looks to the foundry to make the best job it can of the case. The result generally is good. It should, however, be borne in mind that a higher factor of safety is advisedly applied in the case of castings than in the case of forgings. The occasional unsoundness or the hidden defect must not unduly prejudice the working parts.

As regards specifications for castings, it might be observed that the intrinsic properties of cast and properly heat-treated steel are excellent, but frequently, as regards the cast-on test-pieces, it must be pointed out that there is difficulty in arranging the local feeding of the steel to produce perfect soundness and thus bring out the intrinsic values of the material in the test figures. This is a universally-appreciated difficulty with castings which cannot be too much emphasised. Everything points to the wisdom of complete confidence and interchange of ideas between the designer, the engineer and the steelfounder; as regards the design, the manufacture and the final testing, much is to be gained by such intimate collaboration.

In conclusion the author would like to record his appreciation and thanks to Mr. C. W. D. Townsend, the general manager of the Firth-Brown Foundries at Scunthorpe, Lincs, and to Mr. G. Stanfield, M.Eng., B.Sc., and his other colleagues at the Brown-Firth Research Laboratories, for the assistance rendered in the investigations described.

Catalogue Received

Enamelling Equipment and Supplies. Messrs. J. Gray & Sons, Limited, 5, Victoria Street, London, S.W.1, have sent us a copy of their general catalogue, which we presume is unique, as being the only list of everything required by an enamelling shop. It covers the supply of enamels for both wet and dusting processes for both cast and sheet iron; for scales, portable grinders, sieves and strainers, brushes, squeegees, sponges, scoops, palette knives, spraying equipment, protective clothing, fusing clocks, perrits and fusing jigs. These are all listed and detailed, but an inset tells of an even wider range, which includes muffles, annealing furnaces, charging machines, magnetic separators and many other details. The catalogue is of the loose-leaf variety and runs to 22 well-laid-out pages. An improvement could be effected by according to each article a telegraphic code word for the convenience of buyers. For the actual enamels, the four-letter brand marks might suffice.

Outlook for Tin

By "ONLOOKER."

That the tin producers are alive to the dangers inherent in a policy of maintaining the price of their product so far out of line with the values of other metals is made evident by the announcement that in future an advisory panel representing the chief consuming countries will be invited to attend the meeting of the International Tin Committee. Some people will argue that this savours of shutting the stable door after the horse has bolted, and it is certainly true that the search for substitutes has covered a good deal of ground and has at least placed obstacles in the way of an extension in the amount of tin passing into consumption. Glass, aluminium, copper, special paper and cardboard containers, have all come to the front since tin soared over £200. Let us hope that the representatives of the users will not mince their words when they are ushered into the presence of the overlords of tin!

Production has now been brought down again, and for the moment it will probably prove to be adequate, since consumption both in the United States and in this country has declined in rather a marked manner. Recent Board of Trade statistics show that for the nine months to September 30 our exports of tinplates have registered a decline of about 20 per cent., and at the moment there is absolutely no indication of any improvement in conditions in South Wales. Foreign steel billets are no longer available and this may be a partial cause of the falling off in exports, but the inflated price of tin is unquestionably contributing to this unfortunate state of affairs. It may be perfectly true that if reckoned per box the amount of tin used on tinplates is exceedingly small, but when the calculation is made on several thousands of tons of the finished article it is obvious that the present-day inflated price of the metal must make a very big difference.

One assertion, at any rate, cannot be questioned, and that is the fact that consumers, especially in the States, where the ramp in tin values is strongly resented, are buying minimum quantities in the hope that their action may serve to knock away the props at present holding up the quotation. This expectation, however, is not likely to be fulfilled, for on any indication of a setback, the London market is supported, and the existence of a backwardation in the L.M.E. quotation (not now so wide as it has been) indicates the tight grip maintained on nearby supplies. For the moment the situation is in equilibrium, and no major alteration in values is to be anticipated, but, should consumptive demand revive rapidly, a squeeze would result, in consequence of which we should see the price well over £250.

According to one market authority, visible supplies of tin at September 30 were 15,143 tons, or almost exactly half of the total twelve months previously, when the price stood about £10 per ton lower than it does to-day. To this tonnage must be added the carry-over at the Arnhem smelter and in the Straits Settlements, the two aggregating 3,450 tons and giving a grand total of close on 18,600 tons, against 36,000 tons at September 30, 1933. Deliveries during September were down to 6,430 tons, a decline of 1,500 tons compared with August, and on that basis there is roughly three months' supply in sight. There has, of course, been a remarkable change in the state of stocks of tin in this country, for, whereas to-day we hold about 3,600 tons, at September, 1932, the figure was 31,500 tons, and twelve months ago it stood at 13,950 tons.

AN ORDER for a 15-ton shunting locomotive has been received by Messrs. Sir W. G. Armstrong, Whitworth & Company (Engineers), Limited, Newcastle-upon-Tyne, from the Penang Harbour Board.

Practical Points in Foundry Mechanisation

MR. J. N. BURNS ON FORD METHODS

A meeting of the London Branch of the Institute of British Foundrymen was held on October 3, 1934. It was an exceptionally large gathering, and included many visitors, to hear the reading of a Paper by Mr. V. C. Faulkner (Past-President) and Mr. J. N. Burns (plant supervisor, Ford Motor Company), on "The Foundry of Ford Motor Company, at Dagenham."

Mr. F. O. Blackwell (Senior Vice-President of the Branch) presided.

Apologies for absence were received from Mr. A. S. Beech (Branch-President), Mr. A. R. Smith (general manager of the Ford Motor Company at Dagenham), Mr. W. B. Lake, J.P. (Past-President and hon. treasurer of the Institute), Mr. G. E. France, Mr. E. J. Burgess, Dr. A. B. Everest and Mr. V. Delport (Junior Vice-President of the Branch).

MR. FAULKNER, who presented the Paper, in his opening remarks, said that, speaking personally, he was glad to have this privilege of dealing with the Ford foundries, as it afforded him an opportunity of dissipating once and for all such silly gossip which alluded to the Dagenham organisation as a "wild-cat scheme," and "mechanisation gone mad." These charges could be dismissed by anybody who, like the speaker, had been priviledged to examine in detail every aspect of their organisation. There were a number of basic principles or ideals which effected the planning and lay-out of these works. He mentioned as an example a continuous effort to avoid night work and an elimination of stores for the major manufacturing components. This latter had a profound influence on the foundry, as it involved pattern changing at fairly frequent intervals. The ideal of quality was also uppermost in the minds of the management, and that, too, involved the question of sectionalisation with a view to the more rapid detection of lapses from standard.

The actual Paper itself has appeared in our last two issues.

DISCUSSION

The discussion was opened by the chairman (MR. F. O. BLACKWELL), who asked if Mr. Burns could say what was the tonnage output of the foundry, and the units; how many men were employed on the moulding units, including the sand plant; whether the moulds were poured on the conveyors and whether the conveyors were moving continually or were stopped during pouring; and what was the approximate cost of maintenance of the mechanical plant.

Output of the Ford Foundry

MR. J. N. BURNS replied that the tonnage output varied from 120 to 190 tons per day, but the general average is about 170 tons per day. The man-power in each system varied considerably. On No. 1 system, where the heavy tractor parts were made, the machines were all heavy roll-over machines, and were much slower and required more operators than the small jolt-squeeze type on Nos. 3 and 4 systems. The average weight of a mould was from 300 to 400 lbs., and usually necessitated a crane lift. On the system there were 85 men. There were about 20 machine operators and 10 finishers and sprayers. On moulding machines, where moulds were being made at the rate of 15 or 20 per hour, there was no opportunity for slicking. If 15 man/minutes were occupied in making a job, and one moulder spent 5 or 10 minutes in slicking up one mould, the moulding cost was increased by 30 to 60 per cent. Therefore, a number of men were employed on the line inspecting the jobs and doing any slight touching-up that was necessary; if severe touching-up were necessary, the mould was knocked out. The sprayers sprayed were with blacking and the usual facing preparations, and, in many cases, the moulds were skin dried.

The necessary cores were taken off the conveyor by the core-setter and placed in the mould, and each individual core was definitely gauged, to ensure that all thicknesses were accurate. Where cases of dispute arose, a micrometer had often been used. The degree of accuracy achieved was remarkably close; although 10/1,000 in. was the limit allowed on the drawings, in practice the accuracy was always very much closer than that.

There were 11 men engaged in mould closing. On heavy work, they took each job from the machine by means of an overhead crane, placed the top half on the bottom half and closed the job with pins. In most cases it was clamped. They also set the pouring head; where they were tied for headroom, an auxiliary pouring head was placed on the top of the mould; that also was the work of these particular men.

Sand Control

Then there were four men on sand control. Each system had its own sand control and was an entirely separate unit. One man measured, mixed and prepared the facing sand. The testing was left to the laboratory. One man was employed making up the quantity of the heap sand that was taken away with the finished casting. Where there were pockets there was loss of sand, and by the end of a day the amount that could be lost in that way was considerable. It amounted usually to 1 or 1½ tons per hr. Then there were men employed on the conditioning plant proper. One man looked after the tempering of the sand, keeping the riddle clear of papers, etc., and ensuring that the tempering was constant. There was, additionally, another man who set the ploughs to the individual hoppers. It would be noted from the drawings that each plough had a floor-controlled hand-setting device. In theory that was good, but in practice it did not work. If the first man on the line did not like the sand he would just open the hopper and allow 3 or 4 tons to go through to the grating. This, repeated several times, resulted in serious shortage for the operators at the far end of the line, with consequent disorganisation to the whole system. It was necessary, therefore, to make the men use the sand that was given to them, and this was done by controlling the sand distribution from overhead. Any complaints could be made to the foreman.

Shake-out Personnel

There were three or four men on the shake-out, depending on the rate of production. The first knocked the heads off the castings and the heads were placed on a heavy steel barrow to be later returned to the charging floor. The next man threw off the top half of the mould on to the grating; the sand dropped through to the shake-out belt. The third and fourth men clipped the castings with tongs, and by means of a ½-ton electric hoist suspended from a monorail, placed the casting on the cooling conveyor. It was quite simple. The company had spent a lot of time trying automatic devices, but had yet to find a method so reliable as that in use. It might appear to be out of place in a highly-mechanised plant, but there were places at which one could over-mechanise, and this was one of them. He had seen advertisements of automatic knock-outs and shake-outs, and had been to foundries where they were used, but he had yet to appreciate where they increased the output per man. None of these devices would take care of the variation in weight and shape of the castings produced. In a foundry producing one shape of casting all day long it was possible, he believed, to use an automatic shake-out, but neither the Ford Company nor the majority of foundries could do that.

The No. 3 System

On No. 3 system the number of men was slightly greater than on No. 1 system, because the output per machine on No. 3 was greater. On No. 1 system the average production was 15 moulds per hr. On No. 3 system an American jolt-squeeze machine was used, and it was extremely rapid. For jobs about 3 or 4 in. deep, having few cores and no elaborate recesses, the production was anything from 120 to 140 half moulds per machine per hr. The maximum weight was 56 lbs., which is the greatest weight that can be handled efficiently for prolonged periods. The average production on Nos. 3 and 4 systems, taken over all the various jobs, some having five or six cores, was 80 moulds per hr. Although there were 40 machines divided between the two systems, there were usually only ten jobs running, so that 20 machines were actually in use—one machine made the drag and another made the cope.

Between Nos. 3 and 4 there were always 20 machines, that is, ten sets, not on immediate production. They made about 180 different castings, so that continual pattern changing was necessary in order to keep up to the schedule. Whilst the moulders were working on Nos. 1 to 10 sets, the spare ten sets were being prepared for production. As soon as the daily schedule was complete on the first ten, the moulders were withdrawn from them and transferred to the other ten. Whilst they were busy completing the second schedule, the pattern changers made the necessary pattern alterations to the first ten.

The amount of labour not engaged directly in production was fairly high, but there was no question that the system was efficient. A slightly different system had been used in Cork, where it was the practice to make a month's supply in a day or so for any particular casting and then change the patterns for the next casting required, so that there was always a month's supply of any particular casting. Theoretically, that was the soundest practice, because thereby frequent pattern-changing was avoided and a good deal of indirect labour was avoided. But in actual practice, by organisation—and he could not find a really satisfactory reason for it—one obtained much better results by working to a daily figure or, at the most, a weekly figure. That gave the lie to the usual remark one heard in foundries, that completely mechanical systems were all very fine where there were big outputs, but that those who made castings in smaller quantities, and were lucky if they had to make as many as 100 of a particular casting, could not afford such systems. When it was considered that every day at the Dagenham works there were from 20 to 30 pattern changes on one system, it would be appreciated that the practice there was of interest even to a reasonably small jobbing foundry.

Maintenance Costs

The life and maintenance cost of a mechanised foundry such as that at Dagenham depended upon the care and attention to detail on installation. The first cost of such a plant was high. One *could* save much money (in first cost) by buying cheap or simple equipment, but there was no bigger fallacy than to say that it paid to buy cheap equipment in the foundry; it was waste of money. If one were going in for mechanisation one must go in for it properly. In a mechanised foundry the men on the charging floor, the men on the cupolas, the men who were pouring, the moulders, the shake-out men, and all the others each depended on those in front of them. If there were a breakdown which stopped the work of one man, then the whole of the work was stopped, and if one system were stopped there were at least 85 men idle. Those men were paid on an hourly basis, so that if they were idle the company was losing money.

XUM

If they were paid on the piece-work basis—he had no experience of it—unquestionably there would be labour troubles if the operators had to stop work because one remote piece of equipment had failed.

There was a staff of about 30 men looking after the whole of the equipment, and, having regard to the nature and extent of the equipment, that staff could not be considered large. Breakdowns did occur; indeed, it was amazing to see what the average workman could break. One could prove to one's own satisfaction, by a study of the strength of the materials, that it was impossible to break certain components, but they did break. But wear and tear was remarkably low when the plant was properly designed—and in this connection Mr. Burns advised those who were considering mechanisation not to allow the foundry superintendent to do it. He had great respect for foundry superintendents, but mechanisation was a matter entirely apart from ordinary foundry work. There was more in it than merely providing sand hoppers and a conveyor; one must employ people who had been connected with it for a lifetime and who had a detailed knowledge of mechanical foundry requirements.

Bearings on Core Sand Mixers

To illustrate the necessity for experience in detailed design, he mentioned as an example the core-sand mixer, consisting of a trough, about 18 in. wide, having inside it paddles with ordinary cutter blades. These cut the sand and turned it over. The bearings in that machine were subject to the infiltration of sand. A phosphor-bronze bearing on the main cast-iron shaft was theoretically good; in practice, however, the sand worked into it, and, phosphor-bronze being hard, the sand would not embed itself. Thus the shaft probably would not last for more than three or four weeks. On the other hand, if white metal were used, the sand would embed itself, so that the sharp corners would be out of harm's way, consequently the shafts lasted for two years without giving trouble. Again, elevators could give a great deal of trouble; everything in them must be sturdy and of strength immeasurably superior to the theoretical figures. Most of the conveyor people, he believed, were aware of that. Details such as the thickness of hoppers were very important. For example, it was often the practice for a man, if he had not all the sand he wanted, to bang the hopper with a hammer, and a light hopper, if subjected to such treatment, would probably have to be replaced within a year. On the other hand, if the owner of the plant were willing to pay for a more sturdy and heavier hopper, although the first cost would be increased three or four times, the hopper would last for 15 or 20 years.

Pouring Conditions

It was the practice in the Ford Company's foundry to pour the moulds on the conveyor when it was moving. If a conveyor stopped, it was due to one of the men having "fallen down" on his job. Such a hold-up might be due to shortage of metal from the cupola, for instance. Each ladle of metal was tested for temperature and a rough check was made of the analysis; if incorrect, it went straight back to the pig-mould conveyor. If there happened to be a bad run, and two or three ladles had to be sent back, the continuous pouring would naturally cease; the foremen and superintendent had then to busy themselves and straighten out the cupola troubles. For normal production there must be continuous pouring; the moment a conveyor stopped, the company was losing money. Pouring rate was extremely important, and one could only arrive at it by experience. The men gradually improved. At first, if they got down to the job and did not suffer from prejudice—which seems extremely strong in this country—they could pour about five moulds per minute; but later, when they had the "rhythm" of the job and were keen on it, they could pour from 8 to 10 per minute. Pouring at 10 per minute was equivalent to a conveyor speed of about 40 ft. per min. It was the usual practice to pour at 30 ft. per min., *i.e.*, 7 or 8 moulds a minute.

MR. E. A. CHELL, M.I.Mech.E., commenting on the statement in the Paper that the amount of scrap was less than 1 per cent., asked if that figure included the scrap produced in the machine shop after the castings had left the foundry. He asked the question because, in 1926, when he had spent three days in the Detroit factory, the scrap was nearly 5 per cent., but it included both the foundry and machine scrap.

Secondly, Mr. Chell asked if Mr. Burns could state what makes of machines were used for production at the Dagenham works; he did not see why there should be any diffidence about mentioning the names.

European Moulding Machines Criticised

MR. BURNS said that, under the costing system applied by the company, if one made two moulds and one of them was scrapped, then one had made 100 per cent. scrap; one had had to pay for two moulds in order to get one good mould. Foundry scrap discovered during machine operations was included. Under the usual English practice, if one produced one good mould and one that was scrapped, it was recorded as 50 per cent. scrap. Yet, despite this, the Dagenham figures were extremely low, and, at any rate since last Christmas, he could not remember the total scrap figure at Dagenham being above 1 per cent. He could not give details, for they were confidential.

He did not care to mention the individual suppliers of the machines. A good deal of trouble had been experienced with moulding machines, and he had tried to buy them in England, but nearly all the machines he was using were American. On one occasion he had tried hydraulic moulding machines, of French origin, but would not try them again. In Germany, also, he had seen some very elaborate machines, but they had all failed. For some unknown reason, the European moulding-machine designer had not got down to designing a machine in the same way as had the machine-tool designer. The moulding machine was often a slipshod job. One found unhardened pins, working in unbushed holes of the main castings, although they could not be lubricated because escape of lubricant would spoil the moulding sand. In American machines, however, there were always replaceable hardened steel bushes and shafts. There were some European machines which were excellent in theory, but with plain cast-iron bearings and shafts unhardened, and it had been found that they were unable to maintain the necessary accuracy and high production for more than a week.

It seemed that Europeans had not realised the theory of good machine moulding. For instance, in jolting, one placed the box on top of the plate, and if one jolted it on a tilt, the sand would pack up in one corner or the other. The English, and also the German and French, systems had only two guide rods; as a result, there was oscillation, and there was sand packing in the corners and slack parts in other places, which meant bad moulds. Then, with regard to stripping, all the Ford Company's stripping plates were guided on four points integral with the head. The flask was held firmly on the stripper; the pattern, as it dropped away, was on four guides, so that it dropped evenly on the four points, and at 90 deg. to the mould face every time, so giving a clean-cut joint. In pneumatic moulding, unless care were exercised, the bill for compressed air could be increased considerably by leaky pistons and cylinders. At the Dagenham foundry about 700 h.p. were applied to supplying compressed air; if there were leaky piston rings, one could lose 10 or 15 per cent. quite easily. That would show itself on the monthly cost bill, but one would not know where it had gone. In the American machines one could re-bore and replace rings, and fit fresh liners with little trouble. Some of these machines had been in use for 10 years, and operators could not distinguish them from machines which had been bought only two years ago. Until the manufacturers in Europe would get down to those problems, he did not think they could compete with the Americans, who had made machines which were reliable for 24 hours per day, operating on 365 days of each year.

Moisture in Sand Control

MR. B. B. KENT asked if the Ford Company had adopted special means of adding water to the sands used. He had seen a number of mechanised plants in several countries, but they all seemed to have a man sitting on a girder and having one hand on the tap and the other in the sand; that always appeared to him to be a weak point in mechanisation.

MR. BURNS agreed that that was an apparent weakness in all mechanised sand plants. But, on the other hand, he had seen many automatic sprinklers, and none of them could take account of the variable moisture content of the sand. When making heavy jobs, such as flywheels, having 3-in. thickness of metal and weighing 120 lbs., the sand dried out most rapidly; on the other hand, on other jobs, where there was plenty of sand behind them, the heat contact was not the same and there was not the same moisture loss. At the Dagenham works there was an ordinary pipe, with drilled $\frac{1}{16}$-in. holes, and the man controlled the moisture additions by feeling the sand. He did other duties also, such as general supervision, ensuring that there was no apparent mechanical weakness, and so on, so that he was generally busy all the time. Mr. Burns did not think that the foundry would ever be able to do without control in that way, although it appeared to be such an obvious weakness in a mechanised system. A man could control the moisture content of the sand with remarkable accuracy by feeling it. At Dagenham, where they used sand containing 3.4 per cent. moisture, the man controlling it could tell whether it contained 3.7, 3.3 or 3.6, or any other percentage; he seemed to be infallible, for his skill was amazing.

MR. C. H. KAIN (Past Branch-President) confirmed Mr. Burns' remarks concerning the accuracy of hand control of the moisture content of sand. In his own foundry there were sand mixers who regularly controlled the moisture content of the sand to within $\pm$ 0.1 per cent., entirely by feel; the moisture content was checked regularly, every half-hour or so, in a Speedy moisture tester, and the accuracy with which an average workman could control the moisture content was amazing.

He asked if Mr. Burns could give further details of the properties of the sands used at Dagenham—the strength, permeability, etc.—and some further information concerning sand mixing. In the Paper it had been stated that the mixing time was 1 min., which seemed astonishingly short; usually it varied from 5 up to 10 min.

Sand Control

MR. BURNS, who prefaced his reply by remarking that his figures would not convey very much to any who were not familiar with the American standard of test, said that on No. 1 system the bond was held at 6 lbs., and on No. 2 system, where the cylinder blocks were made, the bond was held considerably higher. Each system controlled its own sand. On No. 1 system, which dealt with the large tractor work, the bond was 6 lbs., the permeability was 76 and the moisture content 3.6 per cent. On No. 2 system the bond was 8 lbs., the permeability was 82 and the moisture content 3.5 per cent. No. 3 system, he believed, was similar to No. 2 in respect of sand.

The milling times given in the Paper were correct. The machine used had a length of only

6 ft. and a diameter of 18½ in. It was worked at a rate of 100 tons per hr.—although the plant was rated at 50 tons—and the passage of the sand through it was remarkably quick. This particular one was developed in America a long time ago; and, although he had had a number of pet ideas about circular sand mills and tempering bins, automatic mixers and feeders, etc., the provision of which would have involved the expenditure of thousands of pounds, he had yet to find a machine which would give such a regular quality of sand as that used at Dagenham, and having so low an initial cost. Another advantage was its extreme compactness, a fact which was very important in the Ford Company's foundry, because the whole system there had in view getting much into a small space.

More about Sand Preparation

MR. A. W. G. BAGSHAWE, having noted that a synthetic sand was used at the Ford Company's foundries, asked if they had tried using only one sand in the mould, instead of using a separate facing sand; and, if so, what results had been obtained. The mixing plant was rather unique in this country; there was no storage and no special provision for cooling. Therefore, he asked, what had been the experience in this respect after two or three years' use of the plant.

In the Paper it was stated that the available horse-power was 5,000 in the Ford foundries, and he calculated that that meant 300 h.p. per ton of castings produced. It was interesting to compare that with the figures relating to some other foundries. He presumed that Mr. Burns' reference to an output of 80 or 100 per hr. meant 40 or 50 halves per man, not a total of 80 or 100 complete moulds per hr. The figures relating to the quantity of moulds produced per hr. also wanted a little explanation.

It was pleasing to hear that patterns had to be changed 30 or 40 times a day at the Ford Company's foundries, for there was a tendency to regard the plant as exceptional, dealing with only a few castings. He could wish that his own foundry had to deal with only 180 different types; but, at any rate, it appeared that the conditions in the Ford Company's foundry were approaching those of a jobbing foundry, and the facts suggested that the jobbing foundry had not a long way to go in order to adopt a similar system. If the Ford Company's foundries could do it, then others could also.

MR. BURNS replied that facing sands had been the subjects of experiment since he had joined the Ford Company. At first there were at least 20 different kinds of facing sand, and very fair results were obtained, and it had been mooted that there should be only one facing sand for each system. There had since been a quantity of research by foundry superintendents, foremen, and the laboratory, and as a result, on Nos. 1 and 2 systems there now was one facing sand only. No. 1 system dealt with the whole of the tractor work. The tractor had a 30-h.p. engine, and all parts, including crank case, transmission, chassis and back axle, were made there. The average weight of casting was about 120 lbs., and the castings varied from the thick flywheel, 3 in. thick and 15 in. in dia., to the trans-mission housing, 3 ft. 6 in. by 18 in. dia., and of roughly ⅞ in. section. In Nos. 3 and 4 systems, where the majority of the varying castings were produced, there were only two facing sands. For pistons and valve guides there was a special sand, and that was the only instance in which there was a special facing sand for any special job.

There were many who thought that the cooling and tempering of sand was essential; but he did not agree. He believed the secret of success was to keep plenty of sand in the system, as at Dagenham. If one had a sand-handling plant with a throughput of 20 tons per hr., one could increase the throughput to 50 tons per hr. without incurring a great deal of expense. At Dagenham there was plenty of sand in the system, and the main body was maintained at a reasonable temperature. The addition of moisture also reduced temperature—the reduction by evaporation was remarkable—and the distribution of the sand by a wide and very shallow overhead belt conveyor, which moved quite quickly, also removed some of the heat. In Cork, where there was a short system, trouble had been experienced through the sand getting too hot. Storing in a hopper would not cool the sand, which was one of the best known heat insulators and would not readily give up its heat; if it were stored in a 20-ton hopper, the centre part would maintain its temperature for weeks. In his view, fancy schemes for sand storage represented waste of money.

Power Requirements

The figure of 5,000 available horse-power covered the whole foundry and subsidiary departments. The foundry proper, excluding the patternshops, etc., required 3,480 h.p., and that figure included the power required for serving the whole of the pneumatic machines. An enormous amount of compressed air was used also for cleaning out patterns; even though compressed air was expensive, it was found to be far better to blow the sand off by means of an air jet than by brushing and poking the sand out of the corners. It was all a matter of cost. Unquestionably the power figure for the foundry could be cut, but if it were cut there would be higher labour costs elsewhere.

With regard to output, each machine made half the mould—one made the bottom half and another made the top half; each machine made 145 moulds per hour on jobs with only one or two cores. That figure was maintained for quite a long time in respect of one particular job. The average figure for the 8 hrs.' work, however (allowing for the dead hour after the men started in the mornings, when they had to get into their movements, and also for the short periods before and after lunch and before the end of the day's work, when the work was not so fast), was about 120 per hour per machine. At the end of each moulding system there was a chart, on which the patterns were denoted by serial numbers, and it showed the output for each job. He had seen similar machines in England and on the Continent which were considered to be doing well at an output of 45 per hour. It was important to ensure that the whole of the moulder's time was spent on moulding; he must not have to waste time looking around for his ram or compressed-air jet, and must not have to walk 10 yds. for flasks; everything must be at hand. A man pulled the sand hopper and the sand dropped into the flask; the jolt was started while filling the sand, and the sand could be spread while jolting. While still jolting, the head was pulled over, and as soon as that was done the man pulled off the jolt and put on the squeeze. Only by proper attention to details, such as returning flasks by conveyors, etc., could a man get the best out of a machine.

The CHAIRMAN expressed his personal thanks to the authors for their picture of the Dagenham foundries. Appreciating, however, the initial difficulties which had been experienced by others who had installed mechanised moulding plants, as the result of which difficulties they were apt to lose heart, he would have liked to have heard more about the early troubles and snags at Dagenham. The Ford Company's difficulties, of course, had been lessened because they had been able to draw on the vast experience they had had previously of mechanised plant both in America and at Cork.

Vote of Thanks

MR. A. W. G. BAGSHAWE, proposing a vote of thanks to the authors, on behalf of the Branch, said they had indeed undertaken a difficult task in condensing such a great deal of information into one Paper. He remembered the Dagenham foundries before they had floors or roofs, and it was remarkable that they had developed to the present stage in so short a time. The company were to be congratulated on that score; they had had to train labour and had had to start on almost virgin soil. It was true that they had been able to apply some of their experience from Cork and America, but not a great deal. The secret of their success was summed up in a remark made by an American engineer, that the Ford Motor Company always secured about 25 per cent. more output per machine than any other makers doing the same job with the same equipment, because always they had everything ready. A man never had to wait for a box or a core, and he had not to wait for a box to be taken away. Perhaps that explained the authors' continued references to conveyors.

MR. G. C. PIERCE (Past-Branch-President), who seconded, said that he regretted the authors had not dwelt more upon the psychological or human aspects of the work. He had visited the Dagenham works, had listened very attentively to the reading of the Paper, and claimed to be broadminded, but he shuddered sometimes when he considered the position of the men engaged at the works, and felt that there was something wrong when men had to work in the way they did for a living. He could not conceive that the men who were doing the heavy work around the moulding machines would live long. For example, he had been told that a man lifted the cope of a mould, carried a weight of approximately 80 lbs., 54 times an hour, from the moulding machine to the conveyor, closed the mould, and did one or two incidental jobs in between times also. As Mr. Burns had stated, if some of those present at the meeting had to do that work they would not last half an hour; Mr. Pierce challenged any of them to lift 80 lbs., 54 times per hr., for 8 hrs. It was pleasing to know that tools were always ready to hand. They needed to be!

Apparently Mr. Bagshawe contemplated the development of mechanisation to such a degree that there would be no need for skilled moulders. Mr. Pierce did not agree that that was possible; at any rate, he hoped it was not.

However, he was grateful to the authors for the care and thought they had devoted to the preparation of the Paper, which all had enjoyed.

The vote of thanks was carried with acclamation.

AUTHORS' REPLY

MR. BURNS, responding, said that he had also worked in an English factory and on seeing for the first time conditions in a quantity-production factory he had experienced the same feelings as those expressed by Mr. Pierce; indeed, he supposed he must have been the most arrant grumbler in the company. But as he had gained more experience of it he had come to appreciate it better. He remembered the conditions in an old English factory where the men watched the clock throughout the day, and where time had dragged heavily; in contrast to that, when he had joined the company he had found that time passed quickly; he was interested all day long and he had really enjoyed the experience, and sincerely believed that this was the case with the great majority of employees. Indeed, if the men in the company's works were asked to change from one job to another there would be trouble. Mr. Henry Ford had tried that in America, and had introduced a system of rotary labour, whereby the men were detailed to try different jobs from time to time, and that was the only occasion on which a strike was threatened in the Ford Motor Company. At the Cork factory, the superintendent had sympathised with a man on a heavy job and had moved him to another. Immediately after the luncheon interval, however, the man concerned had asked why he had been shifted and whether he had failed to give satisfaction in his former job. He had not wanted the lighter job that was offered him, but had preferred to go back to the first job.

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At the Ford works there was a wonderful system of medical survey, comparable with that of the leading hospitals. Every man was weighed from time to time, and there was a very careful check on his health. The healthiest men in the works were those engaged on the heaviest jobs. On the other hand, those with the poorest standard of health were the office workers and the men in the tool room and other craftsmen who were not doing hard physical work. After all, hard work was a matter of relativity; what was hard to one man was probably easy to others, and *vice versa*. He, too, would admit that when one considered the figures the results seemed incredible. The lightest mould weighed 40 lbs., but the men made light of the work—and they were not all big, strong men. Injury through lifting was almost unknown in the foundry. The men took pride in their work and each was keen on beating the next man. They were rewarded for extra effort, and he did not think any of them grumbled. Under a system which the men themselves had introduced, one became the pace-maker and each of the others set out to beat him. The labour turnover was almost nil on the heavy work which had been the subject of criticism, and there were always men anxious for the job, and he believed this was ample confirmation that the operators themselves did not share Mr. Pierce's views on their work.

Finally, Mr. Burns assured the members that he was not making propaganda; speaking as an Englishman, trained in this country, he said he would hate to return to the go-as-you-please old conditions which obtained in so many of the old-established industries and which if continued would seriously jeopardise our position as a leading industrial power.

Mr. Faulkner, who also responded to the vote of thanks, said that, from his point of view, the preparation of the Paper had been extremely interesting. He had visited Dagenham and had gathered data, but where there was something missing he had left a blank, and every blank had been filled in by Mr. Burns and his staff. That had impressed him, as showing that the Ford Company had nothing to hide, but would tell everything.

He had noticed that there was a scrap crusher. It was used in the days when a considerable percentage of wasters was made, to reduce cylinders to sizes suitable for charging back into the furnaces. Although that plant was no longer used for that purpose, it might be useful in the future, having regard to the fact that the Ford Company had introduced a system of replacing the engines of motor-cars. That was typical of the refinement in the Ford Company. The machines there were mostly of a mobile character. One constantly encountered some basic principles which governed the whole of their manufacturing conditions.

A Dominion Visitor

One of the visitors at the meeting was Mr. L. Gaussen, the steel-foundry manager of the Vickers Commonwealth Steel Corporation, in Australia. The chairman offered him a hearty welcome, and expressed the hope that the Branch would have the privilege of his presence on future occasions also.

M . Gaussen expressed his thanks for the welcome accorded him.

New Type of Induction Furnace

Information from an authentic source, says "The Iron Age," is to the effect that in Germany and Sweden a new type of electric induction melting furnace has appeared. Low-frequency current is employed for melting down and high-frequency for finishing the heat. It is stated that the melting down is quicker than when only high-frequency current is used and at a less cost and that the use of high-frequency heat to complete the heat is just as efficient and advantageous. Such furnaces are said to be operating in Europe.

Foundry Education in Scotland

MR. H. HURST'S PRESIDENTIAL ADDRESS

The opening meeting of the session of the Scottish Branch of the Institute of British Foundrymen was held on October 13. Mr. J. Currie, retiring President, occupied the chair in the earlier stages of the meeting.

The Chairman said he wished to thank all the members for the strong and loyal support accorded him during the past session, especially Mr. Bell, who had been a tower of strength and whose work had made the President's life a very pleasant one. He then introduced the new President, Mr. Hurst, who had been a member of the Council and Vice-President for a number of years and President of the Paisley section.

Mr. H. Hurst said that his first duty on assuming office was to thank them for having elected him President of the Branch. The next which fell to him to perform was to ask them to accord a vote of thanks to Mr. Currie, the retiring President, for his services during the past session. He had been an excellent President; no effort had been too great for him in carrying on the work of the Branch, and he had done everything possible to ensure success. He asked that they accord Mr. Currie a hearty vote of thanks and to wish him all success in anything which he attempted in the future.

Mr. J. Currie said he was much obliged for their kind expression of thanks; it had been a great pleasure to him to have been able to serve the Scottish Branch.

The President then read his address, in the course of which he said:—I am pleased that conditions of trade generally are better now than when Mr. Currie took over his duties last autumn. After the long depression we are all grateful for this improvement! At the same time, we have got to realise that even yet we cannot call them good. The bad years have left their mark, and it will be a time of trial and great effort for everybody concerned, before the period can be counted but as a memory. Each must do his part in his own sphere to bring that success we all desire, so perhaps it will be as well to examine our own position and consider by what ways and means we can help conditions in general, by making our own part as perfect as possible.

As members of a great Institute, we now have a definite programme laid out to further the welfare of the foundry trade in all its branches. Technical Committees are formed to study all manner of conditions, so that everyone concerned may reap the benefit. I do not propose to go into details regarding their work, as this information is readily available elsewhere. I will only say this is all voluntary work, done often at considerable expenditure of personal time and money by the members of the various Committees, and we owe them a deep debt of gratitude.

The best method of repaying them is by giving our wholehearted support in the working of our own Branch. It is possible many of us could contribute in some way to the technical work of the Institute.

Many members—especially those who we like to call our practical men—have had many experiences which could with advantage be recorded. It is always difficult to get such members to realise this, and I would appeal to them to offer to the Branch such knowledge or experience as they have gained. If it is not, in their opinion, enough to make a full Paper, no doubt some arrangement could be made by the Syllabus Committee to take a group of related subjects at some meeting.

In Glasgow there has recently been opened the Stow College, in which practical foundry work is in progress. Here there is a well-equipped foundry department, complete with cupola, brass-melting furnace, sand mill, oil-sand mixer, core oven, sand riddle, etc. Close co-operation exists between the sections of design, patternmaking and moulding, the teachers in all sections striving to present to the students a complete knowledge of all the factors that go to make a good casting. Directly, the Institute is represented in this work by an Advisory Committee, which has planned the foundry school, and contributed much care and effort to make sure it is on the lines likely to be most useful to the students. Already the Education Committee has expressed its satisfaction with this work, which has further strengthened the good relationship already existing between the officials of the Committee and the Institute.

Incidentally, the Branch is also helping in the work, as, including the services of Mr. Campion as organiser and supervising teacher, and Mr. J. Longden as principal teacher of moulding and foundry work, all the teachers connected with drawing, patternmaking and foundry work, with one exception, are members of this Branch.

Many members of the Branch have helped in other ways, and donations of plant and furnishings have been received as an earnest of a desire to assist in the work. We wish the scheme all success, as this is a matter of immediate concern to all our members, and we feel honoured by the Committee asking us to help in this work. The training of these young people is of vital necessity, for it is to them we must look to carry on our own work.

The present period is one marked by great changes in foundry methods. Designs are being altered by the tendency to eliminate extra castings by what one may term as one-piece design, thinner sections, extra strengths, and the loss of castings owing to fabricated parts produced by welding. Whilst we do not complain, we recognise this makes our work more difficult and our method must change accordingly. In order to keep pace with these changes, we must extend our knowledge of all branches of our work. Our new school is a step in the right direction, for there young students will receive a training which, added to their practical work, will give them a good start. Perhaps the training does not go far enough, but it is a commencement, and it is for use to give our assistance in every possible manner.

In conclusion, I thank you for your attention, and make the old familiar appeal: Please help your Council and myself to make the Scottish Branch the best of all Branches of the Institute, both in regard to quality and quantity of membership, with a special effort to attract and keep the enthusiasm of the younger members connected with our work.

Mr. A. Lawrie (Past-President) said that he had listened to the President's address with a great deal of interest and attention. He had really dealt with a great deal of material in a very short time. There was much in the address that would pay for thinking about. He had seen many Presidents, and the Branch had always been well served in regard to Presidents and secretaries, which was fortunate, as it was the Presidents and secretaries who made a Branch. If they had not been able to figure as the largest Branch in the nation, it was not the fault of the President or secretary. He had much pleasure in asking the members to accord the President a vote of thanks for his address.

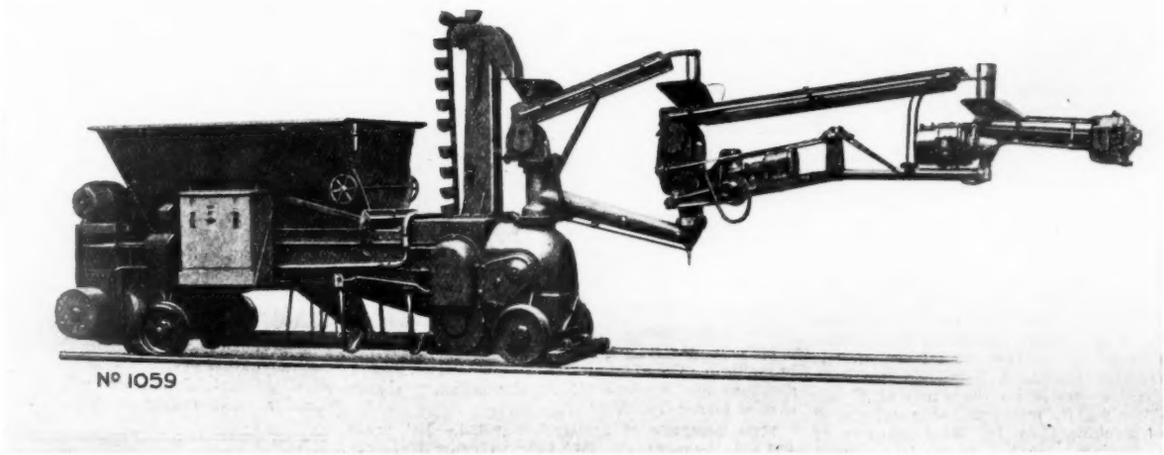
Mr. H. W. Winterton (Past-President), in seconding the vote of thanks, said that they all realised that they had listened to a very practical address. He was interested to find that the text of their President's address was the same as that of the National President. He expressed the hope that the President would have a successful year of office, and that his desires in regard to finance might be realised. He had pleasure in seconding the vote of thanks.

Mr. A. L. Mortimer then read the Paper entitled "The Position of the Designer and Patternmaker in Relation to Foundry Practice

(*Concluded on page* 282.)

LABOUR SHORTAGE ?

In many districts really skilled men are increasingly difficult to obtain, particularly for greensand moulding. Why not release your craftsmen from the burden of hand ramming and reserve them for operations requiring greater skill?



Nº 1059

The Motive type SANDSLINGER shown above is designed for heavier class jobbing—box or pitwork. The ramming arm, of 20 ft. radius, operates on each side of the track. The ramming head has a vertical range of 3 ft. and ramming can be carried out to a depth of 10 ft. Standard hopper capacity 10 tons. Electric push button control of all movements. A sturdy flexible foundry tool which will solve your ramming problem and increase your output.

FOUNDRY PLANT & MACHINERY LTD. 113, W. REGENT ST., GLASGOW

This Week's News in Brief

Trade Talk

THE CHINESE GOVERNMENT PURCHASING COMMISSION has ordered four locomotives from Messrs. Nasmyth, Wilson & Company, Limited, Patricroft.

THE STAFF AND WORKERS of Ardeer Factory and Nobel House have contributed the sum of £231 to West of Scotland institutions during the past three months.

A STEEL MOTOR-TUG, the "Broadstone," was launched from the yard of Messrs. Alexander Hall & Company, Limited, Footdee shipyard, Aberdeen. Built to the order of the Blackfriars Lighterage Company, Limited, London, the vessel is 85 ft. overall length, with 18-ft. breadth.

H.M. DESTROYER "ECLIPSE," built by Messrs. Denny & Company, Limited, Dumbarton, has gone down the river to carry out trials on the Firth of Clyde. She is a sister ship of the destroyer "Echo," built by the same firm and taken over by the Admiralty this week after completing her trials successfully.

A NEW INDUSTRY is to be set up in Johnstone, Renfrewshire. A Glasgow company is being formed to manufacture a new metal having special properties. The old Victoria Foundry, which has been out of commission for some years, has been acquired for the purpose, and operations are expected to begin shortly.

H.R.H. THE DUKE OF YORK will preside at the Industrial Welfare Society's dinner at the May Fair Hotel, Berkeley Square, W.1, on December 11. Other speakers will include Viscountess Snowden, Mr. B. Seebohm Rowntree, Dr. W. J. O'Donovan, M.P., and Mr. Robert R. Hyde. Further particulars may be obtained from the secretary of the Society, 14, Hobart Place, S.W.1.

MESSRS. POTT, CASSELS & WILLIAMSON, LIMITED, sugar-machinery manufacturers, are well employed, and it is reported that inquiries for large contracts for sugar machinery for India are in circulation. The firm, in common with other West of Scotland firms, are tendering, and if orders are placed in the area, it is expected that Messrs. Pott, Cassels & Williamson will reap part of the benefit.

MESSRS. A. & J. INGLIS, LIMITED, Pointhouse, Glasgow, have received an order for a Diesel-electric paddle ship for the London & North Eastern Railway Company, for service on the Firth of Clyde. The ship will be 215 ft. in length, with a beam of 27½ ft. The machinery to be fitted consists of Diesel-electric engines, coupled to electric generators and driving the paddle shaft through a directly-coupled motor, all being supplied by the English Electric Company.

FORMED LESS than four months ago to produce the famous Fyffe's couplings for the Irish Free State market, the new factory conducted by Messrs. Fyffe Couplings (Ireland), Limited, at 16, Back Lane, Dublin, is already working at full pressure. Over £4,000 has been laid out in equipment up to the moment, and additional installations are in anticipation. Mr. R. J. Duggan, Dublin, is chairman of the concern, and the works manager is Mr. T. Williams, who has the distinction of being one of Messrs. Fyffe's original hands.

Foundry Education in Scotland

(*Concluded from page* 280.)

and Scientific Competitive Methods of Producing Castings," for which he was awarded the John Surtees Gold Medal. The Paper was illustrated with lantern slides.

At the conclusion of the meeting the members and friends adjourned to the Cadora Restaurant, where, after tea, the members, their ladies and friends, played whist, for which Mr. R. D. Lawrie acted as M.C. The ladies' prizes were won by Mrs. F. Hudson and Mrs. J. Longden, and the gentlemen's prizes were secured by Messrs. Morehead and Hamilton. Mrs. H. Hurst presented the prizes to the winners, amidst applause. Thereafter vocal numbers and readings were rendered by Miss Young, Miss Lowe and Mr. R. Ballantine.

WE ARE INFORMED by the Stanton Ironworks Company, Limited, near Nottingham, that they are now able to offer a new foundry iron of low-phosphorus content, which in analysis is very similar to Scottish iron. Stanton low-phosphorus foundry pig-iron is a fluid iron suitable for the heavier types of general engineering casting. Used by itself, or blended with other irons, it produces high-strength castings which can easily be machined. This iron can be supplied within close limits, the average analysis being:—Silicon, 2.5-3.25; manganese, 0.8-0.9; sulphur, 0.03; phosphorus, 0.73-0.78; and total carbon, 3.7 per cent.

IN A CIRCULAR to shareholders, the directors of Messrs. Davy Bros., Limited, Sheffield, state that in July last the balance sheet and accounts to March 31 had been prepared, but had not been audited, and now the accounts, subject to audit, have been made up for the period to the appointment of a receiver and manager. This step, the circular adds, was essential to assist the board in negotiations for a reconstruction scheme. Negotiations in this direction are in progress, and everything possible is being done with a view to bringing this about in order, with the co-operation of the creditors, to keep the company as a going concern.

AN EXAMPLE of industrial adaptation is offered by Messrs. John Marshall & Company, Limited, Clyde Boiler Works, Motherwell. The firm has for many years specialised in boiler work for marine furnaces, but when faced with depressed conditions in this line of business, the firm undertook the manufacture of household grates of patent design, which it is marketing with success. The firm still carries on its old manufactures, however, and recently an interesting order for 27 special boilers for Japan was booked. A valuable order from Messrs. D. & W. Henderson, Limited, Partick Shipyard, Glasgow, was obtained. The works are assured of continuous operation for some time to come.

Company Reports

Stanton Ironworks Company, Limited.—Interim ordinary dividend of 4 per cent., less tax.

Herbert Morris, Limited.—Net profit, £36,141; brought in, £24,674; preference dividends, £14,575; dividend of 10 per cent. on the ordinary shares; carried forward, £22,990.

Steel Company of Scotland, Limited.—Net profit, £65,410; brought in, £165,649; to general reserve, £12,500; dividend of 10 per cent.; to tax reserve, £6,000; carried forward, £173,809.

Thos. Firth & John Brown, Limited.—Owing to trade improvement the board have decided to pay a dividend on the 5 per cent. tax-free preference shares up to June 30 last, together with all arrears to that date. Payment will be made on November 12.

Contracts Open

Cairo, November 28.—300 metres of cast-iron water pipes, for the Tanzim Department, Cairo. The Inspecting Engineer to the Egyptian Government, 41, Tothill Street, London, S.W.1.

Blidworth, November 7.—2,400 yds. 6-in. and 4-in. spun-iron pipes, for the Skegby Rural District Council. Mr. L. Dodsley, Portland Chambers, Sutton-in-Ashfield. (Fee £2 2s., returnable.)

Colsterworth, November 7.—Provision and laying of 190 yds. 2-in. cast-iron mains and fittings, for the West Kesteven Rural District Council. Mr. G. F. Dearman, surveyor, Council Offices, 19, Watergate, Grantham.

New Company

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

F. Allen Stanton, Limited, Sentinel House, Southampton Row, W.C.1.—Metal merchants, iron and brass founders. Capital £1,000. Directors: P. J. F. H. Rokker and F. A. Stanton.

Personal

MR. G. GRANT has been presented by the employees and staff of the firm of Messrs. P. & W. MacLellan, Limited, with a grandfather clock, in recognition of his completion of 50 years' service with the firm. Mr. Grant has been a director for the last seven years.

MR. JOHN T. BATEY, who on October 18 was installed President of the North-East Coast Institution of Engineers and Shipbuilders, is managing director of Messrs. R. & W. Hawthorn, Leslie & Company, Limited, Hebburn. Mr. Batey is a Past-President of the Shipbuilding Employers' Federation, and is a director of National Shipbuilders' Security, Limited.

Will

FAIRHILL, THOMAS GRAY CONNELL, Hamilton, retired iron merchant £53,537

Obituary

MR. JOHN CHRISTIE, of Messrs. Smith & Wellstood, Limited, died at his residence, "Thornlea," Bonnybridge, on October 22. Mr. Christie, whilst preparing to go to his work, was seized with a heart attack, and passed away shortly afterwards.

WE VERY SINCERELY REGRET to announce the death of Mr. A. E. Cadman, director of George Garner & Sons, Limited, Canal Foundry, Victoria Street, Openshaw, Manchester, and honorary treasurer of the National Ironfounding Employers' Federation.

MR. GEORGE MCEWAN MILLER, who was a leading figure in Clyde Shipbuilding for over a quarter of a century, died on October 26. Mr. Miller was a director of Messrs. Napier & Miller, Limited, one of the shipbuilding concerns bought over by National Shipbuilders Security, Limited, about three years ago.

WE REGRET TO ANNOUNCE the death of Mr. H. C. Marshall, for many years manager of the foundry of the Gestetner duplicating machine concern. A native of Derbyshire, Mr. Marshall, on his arrival in London, took a profound interest in the affairs of the Institute of British Foundrymen, and had served for several years on the London Branch Council. Like many other really practical men, he was hesitant of expressing his views in public, but after official business had closed, he willingly gave the benefit of his vast experience to all who sought it. His cheerful disposition will long be missed in London ironfounding circles.

Forthcoming Events

NOVEMBER 8.

Institute of Metals:—"Recent Trends and Future Developments in Metallurgical Research," Paper by H. Moore, C.B.E., D.Sc., Ph.D., at the Royal School of Mines, South Kensington, London, S.W.8, at 8 p.m.

NOVEMBER 17.

Falkirk Section:—"Some Observations on the Enamelling of Light Castings," Paper by W. A. Shaw, at the Temperance Café, Lint Riggs, Falkirk, at 6 p.m.

Lincolnshire Section:—"Suggested Method of Establishing Melting Costs in a Grey-Iron Foundry." Results of investigations by the Costing Sub-Committee, presented by C. W. Bigg, at the Technical College, Monks Road, Lincoln, at 7 p.m.

Institute of British Foundrymen

NOVEMBER 10.

Scottish Branch:—"Defects in Iron Castings: Their Cause and Cure," Paper by T. Tyrie, at the Royal Technical College, George Street, Glasgow, at 4 p.m.

NOVEMBER 13.

Burnley Section:—"A Day in a Foundry," Paper by F. Harris, at the Municipal College, Burnley, at 7.15 p.m.

NOVEMBER 14.

London Branch:—Suggested Method of Establishing Melting Costs in a Grey-Iron Foundry." Results of investigations by the Costing Sub-Committee, presented by the Convenor, V. Delport, at the Charing Cross Hotel (First Floor), London, W.C.2, at 8 p.m.

NOVEMBER 16.

Lancashire Branch (Junior Section):—"Non-Ferrous Founding," Paper by C. A. Howe, at the College of Technology, Sackville Street, Manchester, at 7.30 p.m.

Middlesbrough Branch:—"A Few Notes on Continental Steel-Foundry Practice and Castings," Paper by J. G. Wrightson, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 7.45 p.m.

Sheffield and District Branch:—"Suggested Method of Establishing Melting Costs in a Grey-Iron Foundry." Results of Investigation by Costing Sub-Committee, presented by a member of the Committee, at the Grand Hotel, Sheffield, at 7.45 p.m.

XUM

SONGS OF THE SAND

Stanza II.—The Moulder.

When all is really said and done,
Whose task is it to shoulder
The blame for things that will go wrong ;
Why, Yes—it is the Moulder !

On the Foundry Floor with the Sand and the Metal on it,
Where they ram and they jamb and they chip and fettle on it.
Where Moulders labour from hand to hand
And dig right down through the ERITH SAND.
On the Floor 'mid the roar and the clank of wheels on it,
With the jigs and the pigs and the myriad squeals on it.

It's not his job to buy the coke
Or test the metal surely,
But when a Mould goes up in smoke,
Whose fault is it ?—Yours Truly.

On the Foundry Floor where the sparks fly up
And the metal comes in its molten cup,
Where ERITH functions both green and dry
And the Mould is poured either low or high.
Where gases seek for their tiny vent
And the Moulders smile and seem content,
On the Foundry Floor with the ring and the jing of it,
Where the Moulders laugh and want to sing of it.

Yet, his is quite a happy life,
With a cure for ills so near at hand,
To keep immune from care and strife
He always uses ERITH SAND.

On the Foundry Floor at the close of day,
Where the Cast is done and the care's away,
Where the Moulds are shaken and brushed with glee,
Where the Moulder's art is a sight to see.
When the wheels are silent and gone to bed,
When the job's well done and all is said,
It's a Foundry Floor with the ERITH and metal on it
Where they don't have to grind and chip and fettle on it.

December 6th. Stanza III.—The Foreman Moulder.

Erith Loam Marketed in Five Grades—

MILD, MEDIUM, YELLOW, STRONG, EXTRA STRONG and **WHITE SILICA** for Oil Cores

Samples on application to :

J. PARISH & CO., LOAM QUARRIES, ERITH, KENT

Raw Material Markets

The improved conditions in the iron and steel trade have been maintained. Rather more activity has been seen in the pig-iron market during the last week or so, a fair number of forward contracts being recorded. Most of the iron-consuming trades remain generally active, and the outlook for the coming winter is quite good.

Pig-Iron

MIDDLESBROUGH.—Conditions in the Cleveland foundry-iron trade have lately become more active. Actual orders have been heavier and the volume of inquiries is promising. The home demand is such that makers are less inclined to press for export business, which is generally unremunerative. A blast furnace is to be relit, before the end of the year, at the Cleveland works of Messrs. Dorman, Long & Company. There has been no alteration in quotations.

The market in East Coast hematite is very firm. Although export business is poor, being confined to an occasional cargo or two, the demand from the steel-making centres in this country is sufficient to absorb practically the whole output. It is understood that No. 1 East Coast hematite is quoted at round about 61s. per ton f.o.b. for export, while delivered prices in the various zones in this country are:—Middlesbrough, 69s.; North-East Coast, 71s.; Scotland, 75s.; Lancashire, 76s.; Yorkshire, 75s. to 78s.; Birmingham, 79s.; London (by rail), 83s. 6d. per ton. Mixed numbers are 6d. per ton less than No. 1.

LANCASHIRE.—Light-castings makers in this county remain generally busy, although one or two report a slight falling off in activity. Several textile engineers and machine-tool makers are taking bigger deliveries of iron, whilst heavy electrical engineeers are also active. Conditions at the jobbing foundries vary, but are generally on the up grade. A number of contracts have recently been booked, for supplies of iron over the next four to six months, and others are believed to be impending. Prices are well held in all directions, with Derbyshire, Staffordshire, and Lancashire brands of No. 3 foundry iron equal to Derbyshire all quoted for delivery in the Lancashire zone on the basis of 74s. per ton, Northamptonshire at 72s. 6d., Derbyshire forge at 69s. to approved consumers, Scottish foundry at about 82s. 6d., West Coast hematite at around 78s. 6d., and East Coast hematite at 75s. for No. 3 and 76s. for No. 1, both unbroken.

MIDLANDS.—The demand for pig-iron from consumers in this area is generally well maintained, although a slight falling off in activity is reported at one or two light-castings foundries. There was a meeting of the Pig-iron Producers' Association last week, but, as was generally anticipated, no changes in prices were made, so that the minimum controlled rates delivered Birmingham and Black Country stations remain at 67s. 6d. per ton for Northants No. 3 and 71s. for Derbyshire, Lincolnshire and North Staffordshire No. 3, subject to a small rebate to large consumers. Medium-phosphorus engineering pig-iron ranges from 72s. 6d. to 80s., and low-phosphorus from 85s. to 87s. 6d., with Scottish iron, which comes into this category, from 85s. to 90s. per ton, while for special work where a refined iron is wanted, prices range from £5 10s. to £6 15s. per ton, delivered South Staffordshire stations. The market for hematite pig-iron is not very strong. The controlled rates for East Coast and West Coast hematites are £3 18s. and £4 4s. 6d. per ton respectively, with Welsh hematite remaining uncontrolled and being offered at about £3 17s. per ton delivered South Staffs.

SCOTLAND.—Conditions in the pig-iron market are unchanged. The official minimum of 70s. for Scottish No. 3 foundry is still in force, with 2s. 6d. extra for No. 1 quality. These prices are f.o.t. furnaces. There is no alteration to report in the state of the light-castings section of the trade, which continues to be well employed. There is no change in prices of Cleveland iron. The consumers here continue to get the benefit of the preferential rates for Scotland, namely, 67s. 3d. for No. 3 Cleveland, f.o.t. Falkirk area, and 70s. 3d. f.o.t. Glasgow and district.

Coke

Manufacturers of foundry coke are in a strong position, being heavily booked over the next three to six months. No change has taken place in prices, although an upward movement is still expected. Quotations for delivery in the Birmingham area are as follow:—Best Durham coke, 36s. to 40s.; Welsh, 35s. to 45s., according to tonnage and analysis; Scottish low-ash coke, 40s. to 41s. per ton.

Steel

Business in the steel markets, after a spell of comparative quietness, is developing more activity. Trading on home and export account is brighter and orders show a tendency to increase in most departments of the industry, states the official report of the London Iron and Steel Exchange. Conditions in the semi-finished steel department are improving. Smaller quantities of foreign material have been offered in this country of late, and the great bulk of the business coming on the market is being taken by the British works. Some consumers are holding rather large stocks, but there is a brisk demand which in the aggregate reaches a large tonnage. Most of the producing works have enough orders on their books to keep them busy until well into next year. The demand for finished steel is expanding and lately export business in this department has been more satisfactory than for a long time. Home-trade business is steady and there is less irregularity than was noticeable a short time ago.

Scrap

In the Cleveland district heavy cast iron is now firmly quoted at 52s. 6d., with machinery metal at 55s. and light cast iron at about 41s. per ton, delivered works. There is a consistent demand for scrap in the Midlands area, prices remaining unchanged. In South Wales, there is a good demand for heavy cast iron in large pieces and furnace sizes at about 50s. per ton, but there is only a limited call for light metal and machinery grade, at 42s. 6d. and 52s. 6d. to 55s. per ton respectively. In Scotland, machinery cast-iron scrap is firm at 55s. to 56s., with ordinary cast, in pieces not exceeding 1 cwt., 52s. 6d.

Metals

Copper.—The copper market developed a much firmer tone and more confidence, buying having broadened out considerably during the past week. There has, however, been little purchasing by actual users, the increased interest being mainly speculative. Resumed buying by Japan and the possibility of an early return to better trading conditions with Germany are factors which have influenced the market. The chief cause of the return of confidence has been the probability of an international agreement being reached for the restriction of production, as further rumours have been circulating to this effect. Another big United States copper producer, the Phelps Dodge group, has announced its intention of reducing output by 20 per cent.

Daily market prices:—

Cash.—Thursday, £27 17s. 6d. to £28; Friday, £28 3s. 9d. to £28 5s.; Monday, £28 18s. 9d. to £29; Tuesday, £28 5s. to £28 7s. 6d.; Wednesday, £27 18s. 9d. to £28.

Three Months.—Thursday, £28 3s. 9d. to £28 5s.; Friday, £28 10s. to £28 11s. 3d.; Monday, £29 5s. to £29 6s. 3d.; Tuesday, £28 11s. 3d. to £28 12s. 6d.; Wednesday, £28 5s. to £28 6s. 3d.

Tin.—Consumption of tin in this country is maintained on a good scale, the tinplate works in South Wales being very busy, but conditions on the Continent are not so satisfactory.

Referring to the recent meeting of the International Tin Committee, Messrs. Rudolf Wolff state in their weekly report that "there will be another meeting in Paris on November 22, when the advisability of a further reduction in quotas will be considered. It is not impossible that there may be some further curtailment, as there is a tendency for consumption to ease off. Prices here remain very steady and offerings are well absorbed, a fair amount of support being given to the market, especially for the forward position."

Price fluctuations:—

Cash.—Thursday, £229 12s. 6d. to £229 15s.; Friday, £229 15s. to £229 17s. 6d.; Monday, £229 10s. to £229 15s.; Tuesday, £229 10s. to £229 15s.; Wednesday, £229 7s. 6d. to £229 10s.

Three Months.—Thursday, £228 10s. to £228 12s. 6d.; Friday, £228 10s. to £228 12s. 6d.; Monday, £228 10s. to £228 12s. 6d.; Tuesday, £228 10s. to £228 12s. 6d.; Wednesday, £228 10s. to £228 12s. 6d.

Spelter.—This has been a much firmer market recently, due chiefly to the general upward rise in base metals, but also to an increased demand from the Indian market.

Day-to-day quotations:—

Ordinary.—Thursday, £12 16s. 3d.; Friday, £13; Monday, £12 16s. 3d.; Tuesday, £12 16s. 3d.; Wednesday, £12 13s. 9d.

Lead.—"There has been a steady improvement in the price of lead during the week and the market has maintained a firm appearance. This improvement is justified in view of the better conditions prevailing in the cable industry and the continuance of activity in the building trade. The position on the Continent is not quite so favourable, but here also there are signs of an increase in consumption," report Messrs. Brandeis, Goldschmidt.

Price fluctuations have been as follow:—

Soft Foreign (Prompt).—Thursday, £10 12s. 6d.; Friday, £10 17s. 6d.; Monday, £10 17s. 6d.; Tuesday, £10 16s. 3d.; Wednesday, £10 13s. 9d.

Notes From the Branches

Middlesbrough.—A lecture, profusely illustrated with lantern slides, was given by Mr. H. Cowan, B.Sc., of Falkirk, before the Middlesbrough members of the Institute of British Foundrymen at the Cleveland Technical Institute, Middlesbrough, on Friday night. Mr. J. Hackwood, Branch-Chairman, presided.

Dealing with some recent developments in foundry melting practice, MR. COWAN dealt with four kinds of melting furnaces, the ordinary and the balanced-blast cupolas, the rotary pulverised-fuel furnace, and the oil-fired rotary melter. He declared that the design of cupolas had become a fetish, and many of the foundrymen knew nothing about the work they had to do. Much as he regretted to say it, he was convinced that the operations of a cupola were not placed before foundrymen in the way he best understood. He had seen cupola furnaces run which would have done credit to comic opera. Everything depended on the way a cupola was worked, and he had seen an old-fashioned cupola, when properly run, give results which the most modern type could not improve upon.

There had also been a tendency towards the spectacular in cupola furnaces, and in Scotland they had no fewer than seventeen mechanical chargers built, but they had only now two in use. While the rotary pulverised-fuel cupola and the oil-fired type were better for the production of more refined kinds of iron, the old style of cupola, managed by common sense and experienced workmen, produced just as good class of iron as the later type.

He was convinced that the rotary type of furnace had come to stay, for there was no doubt that it was a definite advance. Great benefit was to be derived from the addition of soda ash to the molten metal, due to the agitation it set up, causing de-gasification. The process could also be obtained by the mechanical jolting of the molten metal.

A special type of electric rocking furnace, embodying the mechanical agitation process, had produced iron with 25 per cent. greater mechanical strength. Thus, there must be something to be said for de-gasification by agitation.

ESCOL ENAMELS

WE DO NOT BELIEVE IN THE DOCTRINE OF "SALES REGARDLESS"

It is comparatively easy to sell by extravagant claims, but
we will CONTINUE to sell Escol Enamels on merit only

WE SUPPLY PROVED EQUIPMENT AND REQUISITES COVERING EVERY REQUIREMENT OF THE

VITREOUS ENAMELLER!!!

J. GRAY & SONS LTD.,

Enamelling Engineers,

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Telephone: VICtoria 5794. Telegrams: "Grayasons, Sowest, London."

Sole Manufacturers of Escol Enamels: J. F. Stewart & Co., Ltd., Paisley Works, Swain's Road, Tooting, London, S.W. 17.

CAST IRON FLANGED PIPES

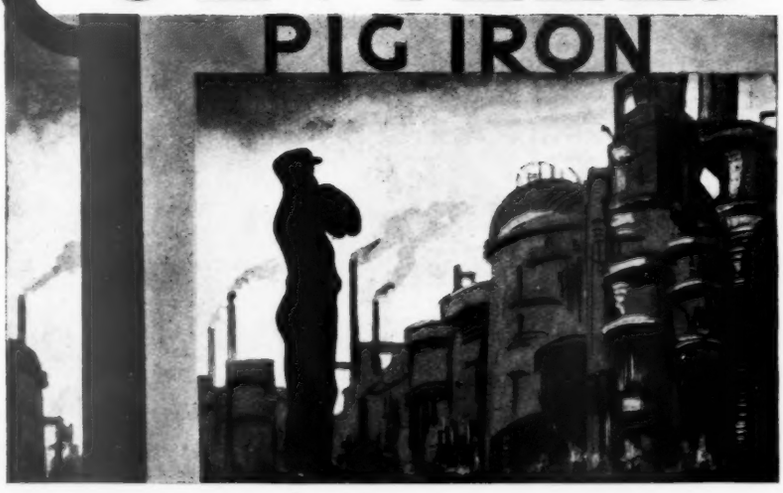
2 in.–12 in. & CONNECTIONS. to 24 in. dia.

WE HAVE FIFTY-TWO YEARS OF ACCUMULATED EXPERIENCE AND METAL PATTERNS.

JAMES & RONALD RITCHIE, LTD.,

Telephone: 3852 (2 Lines). MIDDLESBROUGH. Telegrams: "Ritchie, Middlesbrough."

COLVILLES PIG IRON



BRANDS

DALZELL, GLENGARNOCK CLYDE & MONKLAND

HIGH GRADE HEMATITE PIG IRON

SPECIAL & ORDINARY FOUNDRY QUALITIES & FORGE

SPECIAL REFINED WITH TOTAL CARBON GUARANTEED NOT EXCEEDING 3% MAX.

HEAD OFFICE:–

195, W. GEORGE ST., GLASGOW

'PHONE: CENTRAL 9280 'GRAMS: 'COLVILLETT' GLASGOW

Write for our Illustrated Booklet

RAW MATERIALS—PRICE LIST

(Wednesday, October 31, 1934)

COPPER

	£	s.	d.
Standard cash	27	18	9
Three months	28	5	0
Electrolytic	30	10	0
Tough	29	15	0
Best selected	30	5	0
Sheets	58	0	0
India	41	5	0
Wire bars	31	15	0
Ingot bars	31	15	0
H.C. wire rods	34	5	0
Off. av. cash, September	27	11	6⅜
Do., 3 mths., September	27	17	6
Do., Sttlmnt., September	27	11	10½
Do., Electro, September	30	15	8½
Do., B.S., September	30	13	1½
Do., wire bars, September	31	0	3
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6d.

BRASS

Solid drawn tubes	8¾d.
Brazed tubes	10¾d.
Rods, drawn	8⅛d.
Rods, extd. or rlld.	4¼d.
Sheets to 10 w.g.	7d.
Wire	7⅛d.
Rolled metal	6¼d.
Yellow metal rods	4½d.
Do. 4 × 4 Squares	5⅛d.
Do. 4 × 3 Sheets	5½d.

TIN

	£	s.	d.
Standard cash	229	7	6
Three months	228	10	0
English	229	10	0
Bars	231	7	6
Straits	229	12	6
Australian (nom.)	—		
Eastern	230	5	0
Banca	230	15	0
Off. av. cash, September	230	0	0¾
Do., 3 mths., September	227	17	3
Do., Sttlmt., September	230	1	0

SPELTER

	£	s.	d.
Ordinary	12	13	9
Remelted	13	15	0
Hard	11	0	0
Electro 99.9	15	3	9
English	13	18	9
India	12	10	0
Zinc dust	17	0	0
Zinc ashes	3	0	0
Off. aver., September	12	14	10⅞
Aver. spot, September	12	12	10½

LEAD

	£	s.	d.
Soft foreign ppt.	10	13	9
Empire (nom.)	11	13	9
English	12	15	0
Off. average, September	10	10	0
Average spot, September	10	7	9

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	10	0
Do., V.M. ex whse.	23	0	0
Rods	27	5	0

ANTIMONY

	£	s.	d.	£	s.	d.
English	48	0	0	to 50	0	0
Chinese, ex-whse.				44	10	0
Crude				—		

QUICKSILVER

	£	s.	d.	£	s.	d.
Quicksilver	11	2	6	to 11	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS

	£	s.	d.
Ferro-silicon—			
25%	8	17	6
45/50%	13	0	0
75%	18	7	6
Ferro-vanadium—			
35/50%	12/8 lb. Va.		
Ferro-molybdenum—			
70/75% carbon-free	5/6 lb. Mo.		
Ferro-titanium—			
23/25% carbon-free	9d. lb.		
Ferro-phosphorus, 20/25%	£14	10	0
Ferro-tungsten—			
80/85%	3/- lb.		
Tungsten metal powder—			
98/99%	3/3 lb.		
Ferro-chrome—			
2/4% car.	29	15	0
4/6% car.	23	0	0
6/8% car.	21	12	6
8/10% car.	21	12	6
Ferro-chrome—			
Max. 2% car.	35	0	0
Max. 1% car.	38	15	0
Max. 0.70% car.	42	0	0
70% carbon-free	10d. lb.		
Nickel—99.5/100%	£200 to £205		
"F" nickel shot	£184	0	0
Ferro-cobalt, 98/99%	5/3 lb.		
Metallic chromium—			
96/98%	2/5 lb.		
Ferro-manganese (net)—			
76/80% loose	£10	15	0 to £11 5 0
76/80% packed	£11	15	0 to £12 5 0
76/80% export	(nom.)	£9	15 0
Metallic manganese—			
94/96% carbon-free	1/2 lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{5}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel	2	15	0	to 2	17	0
Bundled shrngs.				2	7	6
Mixed iron and steel	2	10	0	to 2	12	6
Heavy cast iron				2	10	0
Good machinery	2	12	6	to 2	15	0
Cleveland—						
Heavy steel				2	10	0
Steel turnings				1	15	0
Cast-iron borings				1	5	0
Heavy forge				2	10	0
W.I. piling scrap				2	5	0
Cast-iron scrap	2	12	6	to 2	15	0
Midlands—						
Light cast-iron scrap				2	7	6
Heavy wrought iron				2	17	6
Steel turnings, f.o.r.				1	12	6
Scotland—						
Heavy steel	2	10	0	to 2	11	3
Ordinary cast iron				2	12	6
Engineers' turnings				1	19	6
Cast-iron borings	1	18	6	to 2	0	0
Wrought-iron piling	2	10	0	to 2	11	3
Heavy machinery				2	15	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	24	0	0
Brass	16	10	0
Lead (less usual draft)	10	0	0
Tea lead	7	0	0
Zinc	9	0	0
New aluminium cuttings	66	0	0
Braziery copper	19	0	0
Gunmetal	23	0	0
Hollow pewter	150	0	0
Shaped black pewter	112	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	70/-
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	69/-
Hematite M/Nos.	68/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	72/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	67/-
,, No. 3 fdry.	71/-
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/-
,, fdry. No. 3	71/-
,, fdry. No. 1	74/-
Scotland—	
Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/-
Hem. M/Nos. d d	71/-
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
E.C. hematite	81/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	74/-
Staffs fdry. No. 3	74/-
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/6
Clyde, No. 3	82/6
Monkland, No. 3	82/6
Summerlee, No. 3	82/6
Eglinton, No. 3	82/6
Gartsherrie, No. 3	82/6
Shotts, No. 3	82/6

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

	£	s.	d.	£	s.	d.
Iron—						
Bars (cr.)	9	12	6	to 9	15	0
Nut and bolt iron	7	10	0	to 8	0	0
Hoops	10	10	0	and up.		
Marked bars (Staffs) f.o.t.	12	0	0			
Gas strip	10	10	0	and up.		
Bolts and nuts, ¾ in. × 4 in.	14	0	0			
Steel—						
Plates, ship, etc.	8	15	0	to 8	17	6
Boiler plts.	8	0	0	to 8	10	0
Chequer plts.	10	7	6			
Angles	8	7	6			
Tees	8	7	6			
Joists	9	7	6			
Rounds and squares, 3 in. to 5½ in.	8	15	0			
Rounds under 3 in. to ⅝ in. (Untested)	9	7	6			
Flats—8 in. wide and over	8	12	6			
,, under 8 in. and over 5 in.	8	12	6			
Rails, heavy	8	17	6			
Fishplates	8	5	0	to 8	10	0
Hoops (Staffs)	12	5	0	to 12	10	0
Black sheets, 24g. (4-t. lots)	9	7	0			
Galv. cor. shts. (,,)	10	10	0			
Galv. flat shts. (,,)	13	0	0			
Galv. fencing wire, 8g. plain	13	10	0			
Billets, soft	14	10	0			
Billets, hard	5	10	0	and up.		
Sheet bars	6	17	6	to 7	2	6
Tin bars	5	2	6	to 5	10	0
	5	2	6	to 5	7	6

PHOSPHOR BRONZE

	Per lb. basis.
Strip	9d.
Sheet to 10 w.g.	10d.
Wire	11¼d.
Rods	10d.
Tubes	13d.
Castings	10⅝d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7¼
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Bessemer	20.76
Malleable, Valley	18.50
Grey forge, Valley	18.25
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.60
Plain wire	2.30
Barbed wire, galv.	3.00
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	19/- to 21/-
Durham foundry	20/- to 25/-
,, furnace	17/6
Midlands, foundry	—
,, furnace	—

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box		18/2 to 18/7½
,,	28×20	,,	36/4 to 37/3
,,	20×10	,,	26/-
,,	18⅞×14	,,	18/7½ to 18/9
C.W.	20×14	,,	15/7½
,,	28×20	,,	33/9 to 34/-
,,	20×10	,,	23/-
,,	18⅞×14	,,	16/-

SWEDISH CHARCOAL IRON & STEEL

	£	s.	d.	£	s.	d.
Pig-iron	6	0	0	to £7	0	0
Bars-hammered, basis	£16	0	0	to £16	10	0
Bars and nail-rods, rolled, basis	£15	15	0	to £16	0	0
Blooms	£10	0	0	to £12	0	0
Keg steel	£30	0	0	to £31	0	0
Faggot steel	£18	0	0	to £23	0	0
Bars and rods dead soft, st'l	£10	0	0	to £12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

		£	s.	d.	
Oct.	25 ..	27	17	6	No change
,,	26 ..	28	3	9	inc. 6/3
,,	29 ..	28	18	9	,, 15/-
,,	30 ..	28	5	0	dec. 13/9
,,	31 ..	27	18	9	,, 6/3

Electrolytic Copper

		£	s.	d.	
Oct.	25 ..	30	10	0	inc. 5/-
,,	26 ..	31	5	0	,, 15/-
,,	29 ..	32	0	0	,, 15/-
,,	30 ..	31	5	0	dec. 15/-
,,	31 ..	30	10	0	,, 15/-

Standard Tin (cash)

		£	s.	d.	
Oct.	25 ..	229	12	6	dec. 15/-
,,	26 ..	229	15	0	inc. 2/6
,,	29 ..	229	10	0	dec. 5/-
,,	30 ..	229	10	0	No change
,,	31 ..	229	7	6	dec. 2/6

Tin (English ingots)

		£	s.	d.	
Oct.	25 ..	229	15	0	dec. 30/-
,,	26 ..	229	15	0	No change
,,	29 ..	229	10	0	dec. 5/-
,,	30 ..	229	10	0	No change
,,	31 ..	229	10	0	,, ,,

Spelter (ordinary)

		£	s.	d.	
Oct.	25 ..	12	16	3	inc. 1/3
,,	26 ..	13	0	0	,, 3/9
,,	29 ..	12	16	3	dec. 3/9
,,	30 ..	12	16	3	No change
,,	31 ..	12	13	9	dec. 2/6

Spelter (Electro, 99.9 per cent.)

		£	s.	d.	
Oct.	25 ..	15	6	3	inc. 1/3
,,	26 ..	15	10	0	,, 3/9
,,	29 ..	15	6	3	dec. 3/9
,,	30 ..	15	6	3	No change
,,	31 ..	15	3	9	dec. 2/6

Zinc Sheets (English)

		£	s.	d.	
Oct.	25 ..	23	10	0	No change
,,	26 ..	23	10	0	,, ,,
,,	29 ..	23	10	0	,, ,,
,,	30 ..	23	10	0	,, ,,
,,	31 ..	23	10	0	,, ,,

Lead (English)

		£	s.	d.	
Oct.	25 ..	12	10	0	No change
,,	26 ..	12	15	0	inc. 5/-
,,	29 ..	12	15	0	No change
,,	30 .	12	15	0	,, ,,
,,	31 ..	12	15	0	,, ,,

AVERAGE MONTHLY PRICES OF WEST COAST HEMATITE MIXED NUMBERS DELIVERED SHEFFIELD

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1895	42 8	42 5½	42 6	42 10	43 10	43 7½	44 10	45 11	49 11	48 9	47 7½	47 7½	45 2½
1896	47 0	48 9	48 9	48 2½	47 3	47 3	46 10	46 10	47 2	48 5	50 7	50 6	48 1½
1897	51 2	49 10	48 5	47 4	47 9½	48 6	47 0	47 3	47 3	47 0	48 3½	47 11	48 2
1898	48 9	48 10	49 4	49 8½	50 10	50 3½	51 0	52 5	53 11	55 8	57 3	56 10	52 1½
1899	59 1	59 9	57 7	59 6	64 7	70 10½	76 7½	72 2	74 3	75 0	78 1½	73 3	68 5
1900	75 3½	76 10	79 10	84 6	81 4	79 1½	83 4	81 5	79 11	76 10	77 8½	68 4	78 8
1901	60 2	59 0	57 9½	57 6½	57 8	57 4½	57 8	61 0	60 0½	59 9	58 7½	56 7	58 7½
1902	56 1	57 9½	59 3½	59 9	59 10½	60 0	60 0	60 8½	61 5	61 2	59 3	59 0	59 6
1903	58 5	58 8	61 1	59 5	57 10	57 3	56 7	56 3	55 9	54 8	52 4	52 4	56 8½
1904	52 8½	53 1	53 7	54 9	54 2	53 2½	52 9	52 5	52 2½	52 7	53 1	55 11½	53 5½
1905	57 9½	56 9	58 1	58 2	56 4	55 8	55 5½	56 7	61 0	68 9	69 9	70 11½	60 5½
1906	70 4½	65 2½	63 4½	63 9	64 5	64 6	64 1	66 2½	67 3	69 4½	72 4½	78 8½	67 5
1907	77 9	72 11	71 10	73 9	79 9½	76 9	77 9	78 4	75 11	72 9½	68 6	66 7	74 4
1908	62 7	59 1	61 6½	61 6½	61 4	59 1	57 9½	56 11	60 2	59 2	58 5½	57 7	59 7½
1909	51 4	50 5	55 3	56 1	56 4	57 0	56 8	58 0	61 0	61 1½	60 7½	61 4	58 1½
1910	64 0½	64 3½	66 10½	67 6½	66 2½	65 4	64 4½	65 0½	65 2	64 10½	64 6	65 6	65 4½
1911	66 9	66 1	64 10	63 1	62 1	62 0	61 2	62 2	62 1	61 1	61 10	64 0	63 1
1912	67 0	67 0	67 0	69 3	71 9½	72 11	75 5½	79 1½	82 2½	85 0	85 3½	86 6	75 9½
1913	86 6	86 6	86 3	85 0	83 6½	80 10½	78 1	76 10½	72 6	71 0	68 0	65 3	78 4½
1914	64 6	65 4½	65 6	64 11½	64 2½	64 0	64 0	68 11½	74 6½	71 0	65 4½	69 0½	66 10½
1915	78 9	100 6	103 1	113 6	111 9	114 0	116 3	115 2½	113 8½	121 1½	131 9½	139 6½	113 3
1916	135 0	135 0	133 4	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	129 2½
1917	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1918	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1919	127 6	127 6	127 6	127 6	180 6	184 3	195 4½	204 6	204 6	204 6	204 6	204 6	174 7
1920	224 9	235 0	245 0	275 0	290 0	295 0	295 0	295 0	295 0	295 0	295 0	280 0	284 11½
1921	263 4	228 4	180 0	180 0	180 0	160 0	160 0	157 6	142 0	128 6	121 0	115 6	167 9½
1922	125 0	117 6	115 0	115 0	115 0	115 0	113 1½	104 0	105 0	105 0	106 3	110 0	112 1½
1923	109 0½	116 5½	133 11½	138 3½	134 2	125 0	115 7½	111 9	110 0	110 0	113 11	115 0	119 5½
1924	115 0	115 0	114 4½	112 6	112 6	112 6	111 0	110 0	110 0	105 4½	102 6	102 6	110 3½
1925	102 6	102 6	100 0	98 6	97 6	95 1½	92 6	90 6	88 3	87 0	88 1½	88 9½	94 3½
1926	90 1½	90 0	89 8½	89 0	89 0	89 0	90 2½	91 9	94 0	97 2½	*	*	91 0
1927	95 4½	95 6	96 6	95 6	95 3	94 0	92 10½	91 6	90 6	90 6	90 6	89 6	93 1½
1928	85 0	85 3	85 5	85 0	85 3	84 9	84 0	83 9	84 0	84 0	83 1	82 6	84 4
1929	82 10½	83 6	85 0	86 9	87 0	87 0	87 3	87 2½	87 6	89 6	89 6	89 10½	86 11
1930	91 6	91 6	91 6	90 0	89 7½	88 0	87 7½	86 6	86 6	86 6	86 6	86 6	88 6½
1931	86 6	84 6	84 6	84 6	84 6	82 6	82 6	81 6	81 6	83 6	83 6	83 6	83 7
1932	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6
1933	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6
1934	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	—	—	—

* No prices available.

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(Founded 1838)
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